

Chapter 02 - The Chemical Basis of Life

**Chapter 02**  
**The Chemical Basis of Life**

**Multiple Choice Questions**

1. Which of the following is responsible for most of the mass of an atom?

- A. neutron.
- B. proton.
- C. electron.
- D. both neutrons and protons**
- E. both electrons and neutrons

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.1d With respect to the structure of an atom: Distinguish among the terms atomic number, mass number and atomic weight.*

*Learning Objective: 2.01B Define matter, mass, and weight.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

2. The mass number of an element is:

- A. the number of neutrons in the atom.
- B. the number of protons in the atom.
- C. the sum of the number of protons plus the number of neutrons.**
- D. the sum of the number of protons plus the number of electrons.
- E. the sum of the number of neutrons plus the number of electrons

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.1d With respect to the structure of an atom: Distinguish among the terms atomic number, mass number and atomic weight.*

*Learning Objective: 02.01D Define atomic number and mass number.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

3. The chemical notation for Magnesium ions is  $\text{Mg}^{+2}$ . The designation  $2+$  indicates that:
- A. two electrons have been lost
  - B. two protons have been gained
  - C. the ion is negatively charged
  - D. the atomic number is two
  - E. the number of electrons equals the number of protons.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

4. The smallest particle of an element that has the chemical characteristics of that element is a(n)
- A. neutron.
  - B. proton.
  - C. electron.
  - D. atom.
  - E. electron cloud.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01C Distinguish between an element and an atom.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

5. Subatomic particles located in the nucleus of an atom are called

- A. protons.
- B. neutrons.
- C. electrons.
- D. orbitals.
- E.** Both protons and neutrons are correct names.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.1a With respect to the structure of an atom: Describe the charge, mass, and relative location of electrons, protons and neutrons.*

*HAPS Learning Outcome: C01.1b With respect to the structure of an atom: Relate the number of electrons in an electron shell to an atoms chemical stability and its ability to form chemical bonds.*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01E Name the subatomic particles of an atom, and indicate their location.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

6. Subatomic particles that possess a negative charge, and move around the nucleus of an atom are called

- A. protons.
- B.** electrons.
- C. neutrons.
- D. photons
- E. quarks

*Blooms Level: 1. Remember*

*HAPS Learning Outcome: C01.1a With respect to the structure of an atom: Describe the charge, mass, and relative location of electrons, protons and neutrons.*

*HAPS Learning Outcome: C01.1b With respect to the structure of an atom: Relate the number of electrons in an electron shell to an atoms chemical stability and its ability to form chemical bonds.*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01E Name the subatomic particles of an atom, and indicate their location.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

7. The atomic number of an atom is equal to
- A. the number of neutrons in the atom.
  - B. the number of protons in the atom.**
  - C. the sum of the number of protons plus the number of neutrons.
  - D. the sum of the number of protons plus the number of electrons.
  - E. the sum of the number of neutrons plus the number of electrons.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.1d With respect to the structure of an atom: Distinguish among the terms atomic number, mass number and atomic weight.*

*Learning Objective: 02.01D Define atomic number and mass number.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

8. The amount of matter in an object is its
- A. mass.**
  - B. weight.
  - C. atomic number.
  - D. element.
  - E. ionic charge.

*Blooms Level: 1. Remember*

*HAPS Learning Outcome: C01.1d With respect to the structure of an atom: Distinguish among the terms atomic number, mass number and atomic weight.*

*Learning Objective: 2.01B Define matter, mass, and weight.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

9. The chemical behavior of an atom is largely determined by

- A. the number of neutrons it has.
- B. the size of its nucleus.
- C. the electrons closest to the nucleus.
- D. the size of neutrons it has.
- E. its outermost electrons.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C01.1a With respect to the structure of an atom: Describe the charge, mass, and relative location of electrons, protons and neutrons.*

*HAPS Learning Outcome: C01.1b With respect to the structure of an atom: Relate the number of electrons in an electron shell to an atoms chemical stability and its ability to form chemical bonds.*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01E Name the subatomic particles of an atom, and indicate their location.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

10. Every atom of the element carbon has the same number of

- A. protons.
- B. neutrons.
- C. electrons.
- D. photons.
- E. quarks.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01C Distinguish between an element and an atom.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

11. Atoms that have gained or lost electrons are called

- A. ions.
- B. covalents.
- C. nonpolars.
- D. molecules.
- E. neutrons.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

12. After a neutral atom accepts an additional electron, it becomes

- A. positively charged.
- B. negatively charged.
- C. an ion.
- D. a molecule.
- E. both negatively charged and an ion at the same time.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

13. Two atoms with the same number of protons and electrons, but different numbers of neutrons, are called

- A. isotopes.
- B. ions.
- C. electrolytes.
- D. compounds.
- E. Both ions and electrolytes are correct names.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01C Distinguish between an element and an atom.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

14. The chemical symbol  $\text{Ca}^{2+}$  indicates that a calcium atom has

- A. two protons in its nucleus.
- B. lost two neutrons.
- C. gained two protons.
- D. lost two electrons.
- E. an atomic number greater than 2.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

15. If an iron atom (Fe) lost three electrons, what would be the charge of the resulting ion?

- A.  $\text{Fe}^{-3}$
- B.  $\text{Fe}^{+6}$
- C.  $\text{Fe}^{+1}$
- D.  $\text{Fe}^{+2}$
- E.  $\text{Fe}^{+3}$**

*Blooms Level: 6. Create*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

16. Atom X has an atomic number of 20 and has a mass number of 40. The number of protons in atom X is equal to

- A. 10.
- B. 20.**
- C. 30.
- D. 40.
- E. 60.

*Blooms Level: 4. Analyze*

*HAPS Learning Outcome: C01.1d With respect to the structure of an atom: Distinguish among the terms atomic number, mass number and atomic weight.*

*Learning Objective: 02.01D Define atomic number and mass number.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*



17. Atom Y has 11 protons, 11 electrons, and 12 neutrons. What is the atomic number of Atom Y?

- A. 11
- B. 12
- C. 22
- D. 23
- E. 24

*Blooms Level: 6. Create*

*HAPS Learning Outcome: C01.1d With respect to the structure of an atom: Distinguish among the terms atomic number, mass number and atomic weight.*

*Learning Objective: 02.01D Define atomic number and mass number.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

18. Atom Y has 11 protons, 11 electrons, and 12 neutrons. What is the mass number of Atom Y?

- A. 11
- B. 12
- C. 22
- D. 23
- E. 24

*Blooms Level: 6. Create*

*HAPS Learning Outcome: C01.1d With respect to the structure of an atom: Distinguish among the terms atomic number, mass number and atomic weight.*

*Learning Objective: 02.01D Define atomic number and mass number.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

19. \_\_\_\_\_ is a form of potential energy resulting from positions and interactions among subatomic particles.

- A. Chemical
- B. Mechanical
- C. Radiant
- D. Electric
- E. Heat

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01H Differentiate between a molecule and a compound.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

20. Energy

- A. is the capacity to do work.
- B. can neither be created nor destroyed.
- C. is constantly being converted into different forms by the body.
- D. can be stored in the chemical bonds between molecules/subatomic particles.
- E. All of these choices are correct.

*Blooms Level: 4. Analyze*

*Learning Objective: 02.02C Distinguish between chemical reactions that release energy and those that take in energy.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

21. Which of the following analogies does not illustrate the energy type it is paired with?

- A. the cocking back of the trigger on a starters pistol before a race - potential energy
- B. picking up speed as you roll down a snow covered hill in winter - kinetic energy
- C. the stretching of a bungee chord without releasing it - mechanical energy
- D. the spring up you get when you jump on a pogo stick - kinetic energy
- E. basketball players bending their knees before they do a lay-up - mechanical energy

*Blooms Level: 4. Analyze*

*Learning Objective: 02.02C Distinguish between chemical reactions that release energy and those that take in energy.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

22. If the products of a chemical reaction contain less potential energy than the reactants,
- A. energy has been stored in the molecular bonds of the product.
  - B. energy has been released by the breaking of molecular bonds.**
  - C. the reaction will be reversible without additional energy input.
  - D. a synthesis reaction is likely to have occurred.
  - E. All of these choices are correct.

*Blooms Level: 3. Apply*

*Learning Objective: 02.02C Distinguish between chemical reactions that release energy and those that take in energy.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

23. The conversion of ATP into ADP
- A. adds a phosphate group.
  - B. stores energy in the release of an inorganic phosphate group.
  - C. is an example of a exchange reaction.
  - D. is reversible.**
  - E. requires the input of energy.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Energy transfer using ATP*

24. According to the law of conservation of energy, the total energy of the universe is:

- A. constant
- B. increasing exponentially
- C. decreasing exponentially
- D. increasing linearly
- E. decreasing linearly.

*Blooms Level: 2. Understand*

*Learning Objective: 02.02C Distinguish between chemical reactions that release energy and those that take in energy.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

25. The conversion between different states of energy (e.g. potential energy to kinetic energy):

- A. is not 100% efficient
- B. is 100% efficient
- C. typically generates heat
- D. is not possible, energy can not change its state.
- E. is not 100% efficient **and** typically generates heat

*Blooms Level: 3. Apply*

*Learning Objective: 02.02C Distinguish between chemical reactions that release energy and those that take in energy.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

26. When there is an equal sharing of electrons between atoms, the bond that is formed is called:

- A. an ionic bond.
- B. a polar covalent bond.
- C. a non-polar covalent bond.**
- D. a hydrogen bond.
- E. none of these

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

27. Non polar molecules:

- A. are created when the bonding atoms share electrons equally between themselves.**
- B. have an asymmetrical electrical charge.
- C. are also considered ions.
- D. result from polar covalent bonds.
- E. all of these

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Learning Objective: 02.01H Differentiate between a molecule and a compound.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

28. Which of the following statements is FALSE about molecules?

- A. In order to be considered a molecule, a structure must be an independent unit.
- B. All compounds are automatically considered molecules.**
- C. Molecules are formed when two or more atoms chemically combine to form a structure that behaves as an independent unit.
- D. The atoms that make up a molecule can either be the same or different.
- E. The atoms that make up a molecule must be chemically bound to one another.

*Blooms Level: 4. Analyze*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01H Differentiate between a molecule and a compound.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

29. Which of the following is considered a compound but not a molecule?

- A. water ( $\text{H}_2\text{O}$ ).
- B. sodium chloride ( $\text{NaCl}$ ).**
- C. calcium ( $\text{Ca}^{2+}$ )
- D. glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ )
- E. all of these are compounds and molecules.

*Blooms Level: 5. Evaluate*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01H Differentiate between a molecule and a compound.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

30. Which of the following is NOT considered a compound?

- A. water ( $\text{H}_2\text{O}$ ).
- B. sodium chloride ( $\text{NaCl}$ ).
- C. hydrogen chloride ( $\text{HCl}$ )
- D. a hydrogen molecule ( $\text{H}_2$ )**
- E. all of these are compounds.

*Blooms Level: 5. Evaluate*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01H Differentiate between a molecule and a compound.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

31. When one atom loses an electron and another atom accepts that electron a(n) \_\_\_\_\_ bond between the two atoms results.

- A. covalent
- B. hydrogen
- C. ionic
- D. explosive
- E. radioactive

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

32. Covalent bonds occur when

- A. one atom loses an electron.
- B. two substances dissociate in water.
- C. two atoms share electrons.
- D. ions are formed.
- E. one atom gains an electron.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

33. The unequal, asymmetric sharing of electrons which results in one end (pole) of the molecule having a small electrical charge opposite the other end is called

- A. hydrogen bonding.
- B. polar covalent bonding.**
- C. double covalent bonding.
- D. ionic bonding.
- E. non-polar covalent bonding.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

34. If a molecule consists of two or more different kinds of atoms, it is a(n)

- A. atom.
- B. ion.
- C. isotope.
- D. compound.**
- E. Both atom and ion are correct names.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01H Differentiate between a molecule and a compound.*

*Section: 02.01*

*Topic: Chemistry*



35. Ionic compounds

- A. are held together by the force of attraction between oppositely charged ions.
- B. are not considered to be molecules.
- C. do not have distinct units.
- D. All of these choices are correct.**
- E. None of these choices are correct.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

36. When the hydrogen bonds that maintain a protein's three-dimensional shape are broken, the protein becomes nonfunctional, and is said to be

- A. essential.
- B. denatured.**
- C. structural.
- D. unsaturated.
- E. saturated.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01G Explain what creates a hydrogen bond and relate its importance.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

37. The chemical compound that is represented by the acronym DNA

- A. contains the sugar deoxyribose.
- B. has two chains that form a double helix.
- C. is composed of nucleotides.
- D. is responsible for controlling cell activities.
- E. has all of the properties listed here.

*Blooms Level: 4. Analyze*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Nucleic acids: DNA and RNA*

38. Given that sodium bicarbonate dissociates to form  $\text{Na}^+$  and  $\text{HCO}_3^-$  when mixed with water, which of these would be part of the explanation for taking bicarbonate ( $\text{NaHCO}_3$ ) for excess stomach acid?

- A.  $\text{NaHCO}_3$  will not release hydrogen ions when mixed with water.
- B.  $\text{HCO}_3^-$  will be a hydrogen ion acceptor.
- C. Free hydrogen ions increase the acidity of a solution.
- D. When bicarbonate ions combine with hydrogen ions, the pH increases.
- E. All of these are necessary to fully explain how sodium bicarbonate works to counter excess stomach acid.

*Blooms Level: 4. Analyze*

*HAPS Learning Outcome: C03.4 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*Learning Objective: 02.03B Explain the importance of buffers in organisms.*

*Section: 02.03*

*Topic: Chemical bonding*

*Topic: Chemistry*

39. A(n) \_\_\_\_\_ is formed when one atom loses an electron and another atom accepts that electron.

- A. ion
- B. ionic bond**
- C. hydrogen bond
- D. covalent bond
- E. atom

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

40. A(n) \_\_\_\_\_ is formed when two atoms share electrons.

- A. ion
- B. ionic bond
- C. hydrogen bond
- D. covalent bond**
- E. atom

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C02.1a With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: List each type of bond in order by relative strength.*

*HAPS Learning Outcome: C02.1b With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Explain the mechanism of each type of bond.*

*HAPS Learning Outcome: C02.1c With respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds: Provide biologically significant examples of each.*

*Learning Objective: 02.01F Compare and contrast ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemical bonding*

*Topic: Chemistry*

41. Substances that donate hydrogen ions (protons) to a solution are called

- A. acids.
- B. bases.
- C. alkaline.
- D. salts.

*Blooms Level: 1. Remember*

*HAPS Learning Outcome: C03.4 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Learning Outcome: C03.5 State acidic, neutral, and alkaline pH values.*

*Learning Objective: 02.03A Describe the pH scale and its relationship to acidic and basic solutions.*

*Section: 02.03*

*Topic: Chemical bonding*

*Topic: Chemistry*

42. A solution with a pH of 7 is considered to be

- A. acidic.
- B. basic or alkaline.
- C. neutral.
- D. in equilibrium.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C03.4 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Learning Outcome: C03.5 State acidic, neutral, and alkaline pH values.*

*Learning Objective: 02.03A Describe the pH scale and its relationship to acidic and basic solutions.*

*Section: 02.03*

*Topic: Chemistry*

*Topic: Inorganic compounds and solutions*

43. Chemicals that resist changes in pH when acids or bases are added to a solution are

- A. acids.
- B. bases.
- C. salts.
- D. buffers.

*Blooms Level: 1. Remember*

*HAPS Learning Outcome: C03.4 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*Learning Objective: 02.03B Explain the importance of buffers in organisms.*

*Section: 02.03*

*Topic: Chemistry*

*Topic: Inorganic compounds and solutions*

44. A solution with a greater concentration of hydroxide ions than hydrogen ions is
- A. a buffer.
  - B. a salt.
  - C. basic.**
  - D. acidic.
  - E. hydrophobic.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C03.4 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Learning Outcome: C03.5 State acidic, neutral, and alkaline pH values.*

*Learning Objective: 02.03A Describe the pH scale and its relationship to acidic and basic solutions.*

*Section: 02.03*

*Topic: Chemistry*

*Topic: Inorganic compounds and solutions*

45. Given that  $\text{MgCl}_2$  is composed of  $\text{Mg}^{+2}$  ions and  $\text{Cl}^-$  ions,  $\text{MgCl}_2$  would be considered to be
- A. an acid.
  - B. a base.
  - C. a salt.**
  - D. a buffer.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C03.3 Define the term salt and give examples of physiological significance.*

*HAPS Learning Outcome: C03.4 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*Learning Objective: 02.04A Distinguish between inorganic and organic molecules.*

*Section: 02.04*

*Topic: Chemistry*

*Topic: Inorganic compounds and solutions*

46. \_\_\_\_\_ is formed by the reaction of an acid and a base.
- A. An acid
  - B. A base
  - C. A salt**
  - D. A buffer

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C03.3 Define the term salt and give examples of physiological significance.*

*HAPS Learning Outcome: C03.4 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*Learning Objective: 02.03A Describe the pH scale and its relationship to acidic and basic solutions.*

*Section: 02.03*

*Topic: Chemistry*

*Topic: Inorganic compounds and solutions*

47. A solution with a pH of 4 would have \_\_\_\_\_ hydrogen ions than a solution with a pH of 6.
- A. 2 times more
  - B. 2 times fewer
  - C. 20 times more
  - D. 20 times fewer
  - E. 100 times more**

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C03.4 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

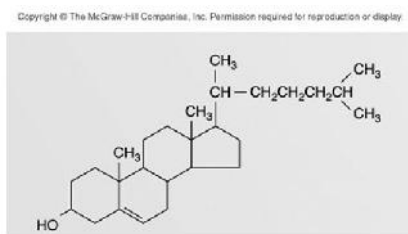
*HAPS Learning Outcome: C03.5 State acidic, neutral, and alkaline pH values.*

*Learning Objective: 02.03A Describe the pH scale and its relationship to acidic and basic solutions.*

*Section: 02.03*

*Topic: Chemistry*

*Topic: Inorganic compounds and solutions*



48. This figure represents an example of a(n)
- A. steroid.**
  - B. triglyceride.
  - C. phospholipids.
  - D. wax.
  - E. fatty acid.

*Blooms Level: 5. Evaluate*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

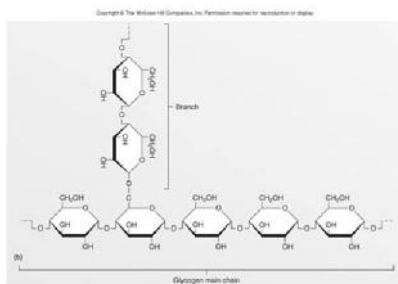
*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

## Chapter 02 - The Chemical Basis of Life



49.

This figure represents an example of a(n)

- A. protein.
- B. nucleic acid.
- C. lipid.
- D. carbohydrate.**
- E. ATP molecule.

*Blooms Level: 5. Evaluate*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

50. Monosaccharides are the building blocks for

- A. carbohydrates.
- B. fats (triglycerides).
- C. nucleic acids.
- D. proteins.

*Blooms Level: 1. Remember*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

51. Glycerol and fatty acids are the building blocks for

- A. carbohydrates.
- B. fats (triglycerides).
- C. nucleic acids.
- D. proteins.

*Blooms Level: 1. Remember*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*



52. Nucleotides are the building blocks for

- A. carbohydrates.
- B. fats (triglycerides).
- C. nucleic acids.**
- D. proteins.

*Blooms Level: 1. Remember*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

53. The macromolecules that function as the genetic material and are involved in protein synthesis are

- A. carbohydrates
- B. lipids
- C. proteins
- D. nucleic acids**

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

54. \_\_\_\_\_ are a common fuel nutrient that has glycogen as a storage form.

- A. Carbohydrates
- B. Lipids
- C. Proteins
- D. Nucleic acids

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

55. A large organic molecule was analyzed and found to contain carbon, hydrogen, oxygen, nitrogen, and sulfur. Of these choices, which would most likely have been the type of molecule analyzed?

- A. carbohydrate
- B. lipid
- C. protein
- D. nucleic acid
- E. steroid

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

56. The building blocks for proteins are

- A. monosaccharides.
- B. disaccharides.
- C. glycerol + fatty acids.
- D. nucleotides.
- E. amino acids.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

57. Which of these statements is true?

- A. Carbohydrates are organic molecules formed from amino acid building blocks.
- B. Monosaccharides become bound together by hydrolysis reactions to form polysaccharides.
- C. Monosaccharides, disaccharides, and polysaccharides are large inorganic molecules.
- D. The building blocks for lipids are nucleotides.
- E. Essential amino acids are those that cannot be synthesized by the body.

*Blooms Level: 4. Analyze*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

58. The chemical compound that is represented by the acronym ATP
- A. is synthesized using energy released during the breakdown of food molecules.
  - B. can be broken down to ADP and a fatty acid.
  - C. has nothing to do with stored energy.
  - D. is a common temporary storage form of immediately usable energy within cells.
  - E. is synthesized using energy released during the breakdown of food molecules and is a common temporary storage form of immediately usable energy within cells.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Energy transfer using ATP*

59. Sucrose is an example of
- A. a monosaccharide.
  - B. a lipid.
  - C. a disaccharide.
  - D. an inorganic molecule.
  - E. a polysaccharide.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

60. Glycogen and starch are examples of

- A. monosaccharides.
- B. nucleic acids.
- C. proteins.
- D. polysaccharides.**
- E. lipids.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

61. Which of these statements concerning lipids is NOT true?

- A. The building blocks of fats (triglycerides) are fatty acids and glycerol.
- B. A fatty acid that contains only single covalent bonds between the carbon atoms is called unsaturated.**
- C. Fats, phospholipids, and steroids are lipids.
- D. Lipids are substances that dissolve in nonpolar solvents.

*Blooms Level: 4. Analyze*

*HAPS Learning Outcome: C04.4a With respect to carbohydrates, proteins, lipids and nucleic acids: Identify the monomers and polymers.*

*HAPS Learning Outcome: C04.4b With respect to carbohydrates, proteins, lipids and nucleic acids: Compare and contrast general molecular structure.*

*HAPS Learning Outcome: C04.4c With respect to carbohydrates, proteins, lipids and nucleic acids: Provide specific examples.*

*HAPS Learning Outcome: C04.4d With respect to carbohydrates, proteins, lipids and nucleic acids: Identify dietary sources.*

*HAPS Learning Outcome: C04.4e With respect to carbohydrates, proteins, lipids and nucleic acids: Discuss physiological and structural roles in the human body.*

*HAPS Learning Outcome: C04.5 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*

*Learning Objective: 02.05A Describe the structural organization and major functions of carbohydrates, lipids, proteins, and nucleic acids.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

62. When two or more atoms, ions, or molecules combine to form a new and larger molecule, the process is called a

- A. decomposition reaction.
- B. synthesis reaction.**
- C. reversible reaction.
- D. buffer reaction.
- E. equilibrium reaction.

*Blooms Level: 2. Understand*

*Learning Objective: 02.02A Summarize the characteristics of synthesis, decomposition, and exchange reactions.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

63. Which of the following processes represents a synthesis reaction?

- A. glycolysis
- B. the creation of a protein from amino acids**
- C. glycogenolysis
- D. All of these are synthesis reactions.

*Blooms Level: 4. Analyze*

*Learning Objective: 02.02A Summarize the characteristics of synthesis, decomposition, and exchange reactions.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

64. Chemical reactions with the property of being able to proceed from reactants to products and from products to reactants are called

- A. exchange reactions.
- B. synthesis reactions.
- C. decomposition reactions.
- D. reversible reactions.**
- E. net reaction rates.

*Blooms Level: 2. Understand*

*Learning Objective: 02.02B Explain how reversible reactions produce chemical equilibrium.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

65. In a reversible reaction, when the rate of product formation is equal to the rate of reactant formation, the reaction is

- A. stopped.
- B. at equilibrium.**
- C. in danger of exploding.
- D. a net decomposition reaction.
- E. a net synthesis reaction.

*Blooms Level: 2. Understand*

*Learning Objective: 02.02B Explain how reversible reactions produce chemical equilibrium.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

66. A substance that increases the rate at which a reaction proceeds, without itself being changed or depleted is a

- A. catalyst.**
- B. reactant.
- C. buffer.
- D. base.
- E. product.

*Blooms Level: 2. Understand*

*HAPS Learning Outcome: C04.6 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme-catalyzed reactions.*

*Learning Objective: 02.02D Describe the factors that can affect the rate of chemical reactions.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

67. Enzymes

- A. are globular proteins.
- B. function as biological catalysts.
- C. lower the activation energy of a reaction.
- D. can be used to regulate chemical reactions.
- E. All of these choices are correct.**

*Blooms Level: 4. Analyze*

*Learning Objective: 02.05B Explain how enzymes work.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*

68. Which of the following will **decrease** the rate at which a reaction occurs?

- A. decreasing the concentration of reactants
- B. increasing the concentration of reactants
- C. increasing the temperature
- D. increasing the amount of the required catalyst
- E. All of these will decrease the rate at which the reaction occurs.

*Blooms Level: 4. Analyze*

*HAPS Learning Outcome: C04.6 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme-catalyzed reactions.*

*Learning Objective: 02.02D Describe the factors that can affect the rate of chemical reactions.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

69. In living things, which of these is most important for regulating the rate of chemical reactions?

- A. changing concentration of reactants
- B. changing temperature
- C. changing concentration and activity of enzymes catalyzing the reactions
- D. nature of reacting substances - carbohydrates react faster than lipids, for example

*Blooms Level: 4. Analyze*

*HAPS Learning Outcome: C04.6 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme-catalyzed reactions.*

*Learning Objective: 02.02D Describe the factors that can affect the rate of chemical reactions.*

*Section: 02.02*

*Topic: Chemical bonding*

*Topic: Chemistry*

70. Enzymes function by

- A. increasing the activation energy needed to start a chemical reaction.
- B. having a specific shape that allows them to bind to particular reactants.
- C. each enzyme acting as a catalyst for many different reaction types.
- D. greatly decreasing reaction rates.
- E. doing all of these.

*Blooms Level: 2. Understand*

*Learning Objective: 02.05B Explain how enzymes work.*

*Section: 02.05*

*Topic: Chemistry*

*Topic: Organic compounds*



71. Which of these is NOT a property of water that makes it useful for living organisms?

- A. Water allows body temperature to increase or decrease rapidly.
- B. Water causes ionic substances to dissociate.
- C. Water acts as a lubricant.
- D. Water is necessary for the transport of nutrients, gases, and waste products.
- E. Water is necessary for many chemical reactions.

*Blooms Level: 3. Apply*

*HAPS Learning Outcome: C03.1 Discuss the physiologically important properties of water.*

*Learning Objective: 02.04B Describe how the properties of oxygen, carbon dioxide, and water contribute to their physiological functions.*

*Section: 02.04*

*Topic: Chemistry*

*Topic: Inorganic compounds and solutions*

72. Which of these is an organic molecule?

- A.  $\text{H}_2\text{O}$
- B.  $\text{H}_2\text{CO}_3$
- C.  $\text{CO}_2$
- D.  $\text{NaCl}$
- E.  $\text{CaCl}_2$

*Blooms Level: 5. Evaluate*

*HAPS Learning Outcome: C04.1 Define the term organic molecule.*

*Learning Objective: 02.04A Distinguish between inorganic and organic molecules.*

*Section: 02.04*

*Topic: Chemistry*

*Topic: Organic compounds*

73. Which of the following pairs correctly matches the example with its classification?

- A. compound - two atoms of hydrogen combined
- B. molecule - sodium chloride
- C. molecule - two hydrogen atoms and one oxygen atom combined
- D. compound - two hydrogen atoms and one oxygen atom combined
- E. molecule - two hydrogen atoms and one oxygen atom combined **and** compound - two hydrogen atoms and one oxygen atom combined

*Blooms Level: 5. Evaluate*

*HAPS Learning Outcome: C01.3 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*Learning Objective: 02.01H Differentiate between a molecule and a compound.*

*Section: 02.01*

*Topic: Atoms and molecules*

*Topic: Chemistry*

## Chapter 02 - The Chemical Basis of Life

### True / False Questions

74.

Chemistry is the scientific discipline that is concerned with cellular composition and the structure of their substances and the reactions they undergo.

**FALSE**

*Blooms Level: 1. Remember*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Objective: 2.01A Learning Outcome: 02.01A Define chemistry and state its relevance to anatomy and physiology.*

*Section: 02.01: Basic Chemistry*

*Topic: Atoms and molecules*

*Topic: Chemistry*

*Type: True/False*

### Multiple Choice Questions

75. Which of the following statements is true?

**A.**

Ionic compounds dissociate in water because the positive ions are attracted to the negative ends of the water molecules and negative ions are attracted to the positive ends of water molecules.

**B.**

Ionic compounds dissociate in water because negative ions are attracted to the negative ends of the water molecules and positive ions are attracted to the positive ends of water molecules.

*Blooms Level: 1. Remember*

*HAPS Learning Outcome: C03.1 Discuss the physiologically important properties of water.*

*HAPS Learning Outcome: C03.2 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.*

*HAPS Learning Outcome: C03.3 Define the term salt and give examples of physiological significance.*

*Learning Outcome: 02.01I Describe the process of dissociation.*

*Section: 02.01: Basic Chemistry*

*Topic: Inorganic compounds and solutions*

*Type: Multiple Choice*