

## Chapter 02 Chemical Basis of Life

### Multiple Choice Questions

1. Matter is composed of elements, which are composed of \_\_\_\_\_.

- A.** atoms
- B. inorganic molecules
- C. organic molecules
- D. chemicals

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

2. The atomic number of an atom equals the number of \_\_\_\_\_ and the atomic weight equals the \_\_\_\_\_.

- A. neutrons; number of protons
- B. protons; weight of all the electrons
- C. neutrons; number of protons plus electrons
- D.** protons; number of protons plus neutrons

*Bloom's Level: 2. Understand*

*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: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

3. In a covalent bond

- A. one atom loses and another atom gains electrons.
- B.** atoms share a pair or more of electrons.
- C. oppositely charged atoms attract.
- D. like-charged atoms repel.

*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 Describe how atomic structure determines how atoms interact.*

*Section: 02.02*

*Topic: Chemical bonding*

4. In an ionic bond

- A. each atom gains electrons.
- B. atoms share a pair or more of electrons.
- C.** oppositely charged atoms attract.
- D. like-charged atoms repel.

*Bloom's Level: 2. Understand*

*HAPS Objective: C02.01a List each type of bond in order by relative strength with respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds.*

*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.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Chemical bonding*

5. Sodium ions and calcium ions are examples of

- A.** cations.
- B. uncharged particles.
- C. anions.
- D. salts.

*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 C01 Atoms and molecules.*

*HAPS Topic: Module C02 Chemical bonding.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Chemical bonding*

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6.

When cations and anions meet, they

- A. repel.
- B. form ionic bonds.**
- C. form covalent bonds.
- D. form individual molecules.

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Chemical bonding*

7. Water causes ionically-bonded atoms to

- A. bond more strongly.
- B. dissociate.**
- C. bond covalently.
- D. decompose.

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Chemical bonding*

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8. Carbon can form \_\_\_\_ covalent bonds.

- A. 1
- B. 2
- C. 4**
- D. 8

*Bloom's Level: 1. Remember*

*HAPS Objective: C01.01b Relate the number of electrons in an electron shell to an atom's chemical stability and its ability to form chemical bonds with respect to the structure of an atom.*

*HAPS Topic: Module C01 Atoms and molecules.*

*HAPS Topic: Module C02 Chemical bonding.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

*Topic: Chemical bonding*

9. Which of the following isotopes has the longest half-life?

- A. Iodine-131
- B. Iron-59
- C. Phosphorus-32
- D. Cobalt-60**

*Bloom's Level: 2. Understand*

*Boxed Reading: From Science to Technology 2.1*

*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 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

10. The \_\_\_\_\_ uses iodine in a synthesis reaction.

- A. spleen
- B. liver
- C. thymus
- D. thyroid gland**

*Bloom's Level: 1. Remember*

*Boxed Reading: From Science to Technology 2.1*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

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11. The isotope most likely to be used to study the thyroid gland is

A.

iodine-131.

B.

iron-59.

C.

thallium-201.

D.

cobalt-60.

*Bloom's Level: 2. Understand*

*Boxed Reading: From Science to Technology 2.1*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

12. Atomic radiation is useful for treating cancer because

A. radiation affects cancer cells but not normal cells.

B. radiation protects normal cells against the effects of cancer.

C. radiation harms cancer cells more readily than it does most non-cancer cells.

D. normal cells are not affected by radiation.

*Bloom's Level: 2. Understand*

*Boxed Reading: From Science to Technology 2.2*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

13. Exposure to ionizing radiation may
- A. cloud the lens of the eye.
  - B. cause cancer.
  - C. interfere with normal growth.
  - D.** all of the above.

*Bloom's Level: 1. Remember*

*Boxed Reading: From Science to Technology 2.2*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

14. Which of the following is not a source of ionizing radiation?
- A. Cosmic rays from outer space
  - B.** Cholesterol and triglycerides
  - C. Atomic and nuclear weapons
  - D. Smoke detectors

*Bloom's Level: 1. Remember*

*Boxed Reading: From Science to Technology 2.2*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

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15. A CT scan differs from a conventional X-ray image because it is

A.

two-dimensional.

B.

three-dimensional.

C.

four-dimensional.

D. safer.

*Bloom's Level: 2. Understand*

*Boxed Reading: From Science to Technology 2.3*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

16. PET imaging follows the emission of

A. positrons.

B. electrons.

C. neutrons.

D. protons.

*Bloom's Level: 1. Remember*

*Boxed Reading: From Science to Technology 2.3*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

## True / False Questions

17. The number of protons in an atom of an element always equals its atomic weight.

**FALSE**

*Bloom's Level: 2. Understand*

*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: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

18. Radioactive isotopes have stable nuclei.

**FALSE**

*Bloom's Level: 2. Understand*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

19. Sodium and chloride atoms combine readily because they both lose electrons.

**FALSE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.01b Relate the number of electrons in an electron shell to an atom's chemical stability and its ability to form chemical bonds with respect to the structure of an atom.*

*HAPS Objective: C02.01a List each type of bond in order by relative strength with respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds.*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Chemical bonding*



20. The symbol  $\text{Na}^+$  represents a sodium atom that has lost an electron.

**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: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes, and radioisotopes*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

21. Water is an example of a compound.

**TRUE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

*Topic: Inorganic compounds and solutions*

22. An atom with 10 protons and which has lost 2 electrons is electrically neutral.

**FALSE**

*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 Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

### **Fill in the Blank Questions**

23. The parts of an atom that carry single negative electrical charges are called \_\_\_\_\_.  
**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: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

24. The type of subatomic particle that does not have an electrical charge is a(n) \_\_\_\_\_.  
**neutron**

*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: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

25. The type of chemical bond formed when ions with opposite electrical charges attract is a(n) \_\_\_\_\_ bond.  
**ionic**

*Bloom's Level: 2. Understand*

*HAPS Objective: C02.01a List each type of bond in order by relative strength with respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds.*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Chemical bonding*

26. Two or more atoms bonding form a \_\_\_\_\_.  
**molecule**

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

### Multiple Choice Questions

27. Chemistry deals with

- A.** the composition and changes of substances that make up living as well as non-living matter.
- B. the composition and changes of substances found in organisms only.
- C. the composition of and changes of substances that make up non-living matter only.
- D. the location of organs in body cavities.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.01 Give examples of how the study of living materials requires an understanding of chemistry.*

*Section: 02.01*

28. Chemistry is important to the study of physiology because

- A. the foods that we eat are chemicals.
- B. body functions depend on cellular functions that reflect chemical changes.
- C. chemical reactions enable our bodies to extract energy from nutrients.
- D.** all of the above.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.01 Give examples of how the study of living materials requires an understanding of chemistry.*

*Section: 02.01*

29. Which of the following substances is an element?

- A. Iron**
- B. Water
- C. Sodium chloride
- D. Glucose

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

30.

Which of the following groups of elements accounts for more than 95% of the human body by weight?

- A. Carbon, hydrogen, oxygen, nitrogen**
- B. Calcium, hydrogen, oxygen, nitrogen
- C. Carbon, phosphorus, oxygen, hydrogen
- D. Calcium, phosphorus, hydrogen, nitrogen

*Bloom's Level: 1. Remember*

*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

31. The atoms of different elements have

- A. the same atomic number and same atomic weight.
- B. the same atomic number but different atomic weights.
- C. different atomic numbers.**
- D. different atomic numbers but the same number of electrons.

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

32. Isotopes of an element have

- A. the same atomic number and same atomic weight.
- B.** the same atomic number but different atomic weights.
- C. different atomic numbers but the same atomic weight.
- D. different atomic numbers and different atomic weights.

*Bloom's Level: 1. Remember*

*HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

33. Which of the following is(are) ionizing radiation?

- A. Cosmic radiation only
- B. Gamma radiation only
- C.** Both cosmic radiation and gamma radiation
- D. Neither cosmic nor gamma radiation

*Bloom's Level: 1. Remember*

*Boxed Reading: From Science to Technology 2.2*

*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 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

34. The atomic weight of an element whose atoms contain 8 protons, 8 electrons, and 8 neutrons is

- A. 8.
- B.** 16.
- C. 24.
- D. 32.

*Bloom's Level: 3. Apply*

*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: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

35. The atoms of the isotopes of a particular element vary in the number of
- A. electrons.
  - B. protons.
  - C. neutrons.**
  - D. nuclei.

*Bloom's Level: 2. Understand*

*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 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

36. The first electron shell of an atom can hold a maximum of
- A. 1 electron.
  - B. 2 electrons.**
  - C. 4 electrons.
  - D. 8 electrons.

*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 C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

37. When forming a bond, an atom that has 3 electrons in its second shell and a filled first shell will
- A. lose 3 electrons from its second shell.**
  - B. lose all of the electrons from its first shell.
  - C. lose all of the electrons from both its first and second shells.
  - D. gain 5 electrons in its second shell.

*Bloom's Level: 3. Apply*

*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: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

38. The formula  $\text{H}_2\text{O}$  refers to

- A. Two hydrogen molecules and one oxygen molecule.
- B. One hydrogen molecule and two oxygen molecules.
- C.** A molecule that contains two hydrogen atoms and one oxygen atom.
- D. A molecule that contains one hydrogen atom and two oxygen atoms.

*Bloom's Level: 2. Understand*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02:02 Explain how molecular and structural formulas symbolize the composition of compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

39. A decomposition reaction can be symbolized by

- A.  $\text{A} + \text{B} \rightarrow \text{C} + \text{D}$ .
- B.  $\text{A} + \text{B} \rightarrow \text{AB}$ .
- C.**  $\text{AB} \rightarrow \text{A} + \text{B}$ .
- D.  $\text{C} + \text{D} \rightarrow \text{AB}$ .

*Bloom's Level: 1. Remember*

*Learning Outcome: 02:02 Describe three types of chemical reactions.*

*Section: 02.02*

*Topic: Atoms and molecules*

40. A water solution that contains equal numbers of hydrogen ions and hydroxide ions is

- A. acidic.
- B. basic.
- C. alkaline.
- D.** neutral.

*Bloom's Level: 2. Understand*

*HAPS Objective: C03.05 State acidic, neutral, and alkaline pH values.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Section: 02.02*

*Topic: Atoms and molecules*

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41. Electrolytes that release hydrogen ions in water are

- A. bases.
- B. nucleotides.
- C. acids.**
- D. electrons.

*Bloom's Level: 2. Understand*

*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: 02:02 Describe the differences among acids, bases and salts.*

*Section: 02.02*

*Topic: Atoms and molecules*

42. The difference in hydrogen ion concentration between solutions with pH 4 and pH 5 is

- A. twofold.
- B. fivefold.
- C. tenfold.**
- D. twentyfold.

*Bloom's Level: 2. Understand*

*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: 02:02 Describe the differences among acids, bases and salts.*

*Learning Outcome: 02:02 Explain the pH scale.*

*Section: 02.02*

*Topic: Atoms and molecules*

43. A chemical reaction in which parts of different molecules trade positions is a(n)

- A. decomposition reaction.
- B. exchange reaction.**
- C. reversible reaction.
- D. synthesis reaction.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02:02 Describe three types of chemical reactions.*

*Section: 02.02*

*Topic: Atoms and molecules*



## Chapter 02 - Chemical Basis of Life

44.

Consider the following list of commonly found items and their pH values:

Battery acid	1.0
Vinegar	2.2
Grapes	3.5-4.5
Tomato	4.0-4.5
Beer	4.2
Coffee	5.0
White bread	5.0-6.0
Butter	6.1-6.4
Egg whites	7.6-8.0
Baking soda	8.3
Milk of magnesia	10.6
Bleach	12.8

Which of the following choices includes all acids?

- A. Egg whites, baking soda, milk of magnesia, and bleach
- B. Tomatoes, egg whites, and baking soda
- C. Vinegar, grapes, tomatoes, and coffee**
- D. Beer, butter, and baking soda

*Bloom's Level: 3. Apply*

*HAPS Objective: C03.05 State acidic, neutral, and alkaline pH values.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02:02 Explain the pH scale.*

*Section: 02.02*

*Topic: Atoms and molecules*

45. Electrolytes are substances that

- A. form covalent bonds with water.
- B. ionize in water.**
- C. cannot conduct electricity in solution.
- D. form bonds that are stable in water.

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes, and radioisotopes*

*HAPS Topic: Module C01 Atoms and molecules.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02:03 List the major inorganic chemicals common in cells and explain the function (s) of each.*

*Section: 02.03*

*Topic: Inorganic compounds and solutions*

46. The pH scale measures the
- A.** concentration of hydrogen ions in solution.
  - B. number of molecules of salts dissolved in water.
  - C. number of hydroxide ions in water.
  - D. strength of an electrical current that a solution carries.

*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: 02:02 Explain the pH scale.*

*Section: 02.02*

*Topic: Inorganic compounds and solutions*

47. Which of the following is the most abundant inorganic substance in the body?
- A. Carbohydrate
  - B.** Water
  - C. Lipid
  - D. Protein

*Bloom's Level: 2. Understand*

*HAPS Objective: C03.01 Discuss the physiologically important properties of water.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02:03 List the major inorganic chemicals common in cells and explain the function (s) of each.*

*Section: 02.03*

*Topic: Inorganic compounds and solutions*

48. A person has alkalosis if the blood pH
- A. is above 7.0.
  - B. is below 7.0.
  - C.** rises above 7.5.
  - D. drops below 7.3.

*Bloom's Level: 2. Understand*

*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Objective: C03.05 State acidic, neutral, and alkaline pH values.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02:02 Describe the differences among acids, bases and salts.*

*Learning Outcome: 02:02 Explain the pH scale.*

*Section: 02.02*

*Topic: Atoms and molecules*

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49.

A complete atom is electrically neutral because

A.

the number of protons equals the number of neutrons.

B.

the number of electrons equals the number of neutrons.

C.

the number of electrons equals the number of protons.

D. electrons is greater than the number of protons.

*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 Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

50. Synthesis reactions are particularly important in the body for

A. release of energy.

B. digestion of food products.

C. growth of body parts.

D. neutralization of acids by buffers.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02:02 Describe three types of chemical reactions.*

*Section: 02.02*

*Topic: Atoms and molecules*

51. On the pH scale

- A. a tenfold difference in hydrogen ion concentration separates each whole number.
- B. the lower the whole number on the scale, the greater the  $H^+$  concentration.
- C. pH values above 7 are basic (alkaline).
- D.** all of the above.

*Bloom's Level: 2. Understand*

*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: 02:02 Explain the pH scale.*

*Section: 02.02*

*Topic: Atoms and molecules*

52. An acid reacting with a base is

- A. a synthesis reaction.
- B. hydrolysis.
- C. a decomposition reaction.
- D.** an exchange reaction.

*Bloom's Level: 2. Understand*

*HAPS Objective: C03.03 Define the term salt and give examples of physiological significance.*

*Learning Outcome: 02:02 Describe the differences among acids, bases and salts.*

*Section: 02.02*

*Topic: Atoms and molecules*

53. Bases reacting with acids form \_\_\_\_\_ and water.

- A. buffers
- B.** salts
- C. new elements
- D. proteins

*Bloom's Level: 2. Understand*

*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: 02:02 Describe the differences among acids, bases and salts.*

*Section: 02.02*

*Topic: Atoms and molecules*

54. The secondary structure of a protein molecule is the result of
- A. oxygen double bonds.
  - B. covalent bonds.
  - C. ionic bonds.
  - D. hydrogen bonds.**

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

55. In the body, oxygen
- A. reacts with water to form carbonic acid.
  - B. is used during cellular respiration.**
  - C. is a major electrolyte.
  - D. is produced by cells.

*Bloom's Level: 2. Understand*

*HAPS Objective: C11.02 With respect to glycolysis, the Krebs (citric acid or TCA) cycle, and the electron transport chain: compare and contrast energy input, efficiency of energy production, oxygen use, by-products and cellular location.*

*HAPS Topic: Module C11 Cellular respiration.*

*Learning Outcome: 02:03 List the major inorganic chemicals common in cells and explain the function (s) of each.*

*Section: 02.03*

*Topic: Cellular respiration*

*Topic: Organic compounds*

56. Which of the following is characteristic of carbohydrates?
- A. They contain C, H, O, with twice as many hydrogen as oxygen atoms.
  - B. They provide much of the energy that the cell requires.
  - C. They include sugars and starches.
  - D. all of the above.**

*Bloom's Level: 1. Remember*

*HAPS Objective: C04.02 Explain the relationship between monomers and polymers.*

*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: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

57. A simple carbohydrate

- A.** has a molecular formula of  $C_6H_{12}O_6$ .
- B. is a building block of protein.
- C. consists of several joined chains.
- D. has only one nucleotide.

*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: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

58. Lipids

- A. are insoluble in water.
- B. include phospholipids, cholesterol, and fats.
- C. contain C, H, and O, but with proportionately less oxygen than in carbohydrates.
- D.** all of the above.

*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: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

59. Proteins denature when

- A. bonds between carbon and oxygen break.
- B.** hydrogen bonds break.
- C. peptide bonds break.
- D. peptide bonds form.

*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: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

60. Which of the following is not organic?

- A.** Sodium chloride
- B. Lipids
- C. Nucleic acids
- D. Enzymes

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.01 Define the term organic molecule.*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*HAPS Topic: Module C04 Organic compounds.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Inorganic compounds and solutions*

*Topic: Organic compounds*

61. Saturated fats \_\_\_\_\_ than unsaturated fats.

- A. contain more water
- B. have more glycerol
- C.** have more single carbon-carbon bonds
- D. have fewer hydrogen atoms bonded to carbon 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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

62. Proteins

- A. are structural materials.
- B. can function as enzymes.
- C. contain C, H, O, and N, and sometimes S.
- D.** all of the above.

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

63. An enzyme is a \_\_\_\_\_.

- A.** protein that speeds up chemical reactions without being changed or depleted
- B. protein that functions as a hormone
- C. protein that inhibits chemical reactions by being changed or depleted
- D. fibrous protein that is part of certain tissues in the body

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme-catalyzed reactions.*

*HAPS Topic: Module C04 Organic compounds.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

64. The parts of a protein that change when it denatures are

- A. the primary and secondary structures.
- B.** the secondary and tertiary structures.
- C. the amino acid sequence and the secondary structure.
- D. the tertiary and quaternary structures.

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

65. DNA

- A. is a protein.
- B. plays no role in the synthesis of fats.
- C.** stores genetic information, including instructions for enzymes that synthesize fats and carbohydrates.
- D. is routinely broken down to provide cellular energy.

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02.03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Nucleic acids: DNA and RNA*

*Topic: Organic compounds*



66. Nucleic acids are

- A. very small, simple molecules.
- B. structural molecules that have no function other than support.
- C.** composed of building blocks called nucleotides.
- D. primary sources of cellular energy.

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Nucleic acids: DNA and RNA*

*Topic: Organic compounds*

67. The informational content of DNA and RNA is in the nitrogenous bases because

- A.** the bases are of several types and therefore can form a code sequence.
- B. they all contain nitrogen.
- C. the sugars and phosphates vary.
- D. the bases are also parts of amino acids.

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*

*HAPS Objective: C04.04e Discuss physiological and structural roles in the human body of carbohydrates, proteins, lipids and nucleic acids.*

*HAPS Topic: Module C04 Organic compounds.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Nucleic acids: DNA and RNA*

*Topic: Organic compounds*

68. In phenylketonuria, an individual cannot break down the amino acid phenylalanine. Molecules that include phenylalanine build up in the blood, which causes intellectual disability and other symptoms. This inherited disease can be controlled by following a diet that is very low in

- A. carbohydrates.
- B. cholesterol.
- C. protein.**
- D. nucleic acids.

*Bloom's Level: 3. Apply*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

69. Table sugar breaking down into glucose and fructose is a(n) \_\_\_\_\_ reaction.

- A. synthesis
- B. hydrolysis**
- C. acid-base
- D. exchange reaction

*Bloom's Level: 3. Apply*

*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*

*HAPS Topic: Module C04 Organic compounds.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

70. Nucleic acids include

- A. proteins and DNA.
- B. RNA and DNA.**
- C. enzymes and RNA.
- D. steroids and triglycerides.

*Bloom's Level: 1. Remember*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*HAPS Topic: Module C04 Organic compounds.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Nucleic acids: DNA and RNA*

*Topic: Organic compounds*

71. DNA and RNA differ in that

- A. RNA has deoxyribose and DNA has ribose.
- B. RNA is double-stranded and DNA is single-stranded.
- C. DNA holds genetic information and RNA uses that information to synthesize protein.**
- D. RNA is found only in the nucleus and DNA is found only in the cytoplasm.

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Nucleic acids: DNA and RNA*

*Topic: Organic compounds*

72. The type of organic molecule that can replicate is a

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

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Nucleic acids: DNA and RNA*

*Topic: Organic compounds*

73. Conformation is

A.

the three-dimensional shape of a molecule, such as a protein.

B. the energy held in the bonds of an organic molecule, such as a protein.

C. the ability of DNA to copy itself.

D. the amino acid sequence (primary structure) of a protein.

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

74. An organic compound always contains

A. carbon and hydrogen.

B. oxygen and nitrogen.

C. carbon and oxygen.

D. nitrogen and hydrogen.

*Bloom's Level: 1. Remember*

*HAPS Objective: C04.01 Define the term organic molecule.*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

75. Which of these is not a monosaccharide?

- A. Glucose
- B. Ribose
- C. 6-carbon sugar
- D. Sucrose**

*Bloom's Level: 1. Remember*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*HAPS Topic: Module C04 Organic compounds.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

76. Glycogen is stored in the liver and \_\_\_\_\_.

- A. spleen
- B. skeletal muscles**
- C. pancreas
- D. heart

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

77. A triglyceride consists of

- A. 3 glycerols and 1 fatty acid.
- B. 3 glucose molecules.
- C. 3 fatty acids and 3 phosphate groups.
- D. 3 fatty acids and 1 glycerol.**

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

78. Which of the following groups of compounds is hydrophobic?

- A. Carbohydrates
- B. Lipids**
- C. Proteins
- D. Nucleic Acids

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

79. Which of the following molecules does not have a polar region?

- A. Water
- B. Triglyceride**
- C.

Water-soluble amino acid

D. Glucose

*Bloom's Level: 3. Apply*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:02 Explain how molecular and structural formulas symbolize the composition of compounds.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

80. A biomarker is

- A. a gene that encodes a particular protein.
- B. always a protein.
- C. a body chemical associated with a particular disease or exposure to a toxin.**
- D. any chemical in the body.

*Bloom's Level: 2. Understand*

*Boxed Reading: Vignette*

*Learning Outcome: 02.01 Give examples of how the study of living materials requires an understanding of chemistry.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.01*

*Section: 02.03*

*Topic: Organic compounds*

81. An example of a biomarker is

- A.** cholesterol.
- B. any DNA sequence.
- C. sodium chloride.
- D. hydrogen.

*Bloom's Level: 1. Remember*

*Boxed Reading: Vignette*

*Learning Outcome: 02.01 Give examples of how the study of living materials requires an understanding of chemistry.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.01*

*Section: 02.03*

*Topic: Organic compounds*

82. A biomarker test for cancer should ideally be

- A. inexpensive.
- B. easy to perform.
- C. specific.
- D.** all of the above.

*Bloom's Level: 1. Remember*

*Boxed Reading: Vignette*

*Learning Outcome: 02.01 Give examples of how the study of living materials requires an understanding of chemistry.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.01*

*Section: 02.03*

*Topic: Organic compounds*

### **True / False Questions**

83. Chemistry is the study of the composition of matter and how matter changes.

**TRUE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01 Give examples of how the study of living materials requires an understanding of chemistry.*

*Section: 02.01*

84. An atom that has gained or lost electrons is called an ion.

**TRUE**

*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 Describe the relationships among matter, atoms, and compounds.*

*Learning Outcome: 02:02 Explain how molecular and structural formulas symbolize the composition of compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

85. A substance that releases hydrogen ions in water is a base.

**FALSE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Learning Outcome: 02:02 Explain how molecular and structural formulas symbolize the composition of compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*

86. A strong acid reacting with a strong base produces a salt.

**TRUE**

*Bloom's Level: 1. Remember*

*HAPS Objective: C03.03 Define the term salt and give examples of physiological significance.*

*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02:02 Describe the differences among acids, bases and salts.*

*Section: 02.02*

*Topic: Atoms and molecules*

87. Chemically inert atoms always have their outermost electron shell full.

**TRUE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.01b Relate the number of electrons in an electron shell to an atom's chemical stability and its ability to form chemical bonds with respect to the structure of an atom.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02.02 Describe the relationships among matter, atoms, and compounds.*

*Section: 02.02*

*Topic: Atoms and molecules*



88. An acid is an electrolyte that releases hydroxide ions ( $\text{OH}^-$ ) in water.

**FALSE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02:02 Describe the differences among acids, bases and salts.*

*Section: 02.02*

*Topic: Atoms and molecules*

89. A base is an electrolyte that releases ions that combine with hydrogen ions.

**TRUE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02:02 Describe the differences among acids, bases and salts.*

*Section: 02.02*

*Topic: Atoms and molecules*

90. An electrolyte ionizes in water.

**TRUE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes, and radioisotopes*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02:03 List the major inorganic chemicals common in cells and explain the function (s) of each.*

*Section: 02.03*

*Topic: Inorganic compounds and solutions*

91. A person with alkalosis has a blood pH less than 7.3.

**FALSE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Topic: Module C01 Atoms and molecules.*

*HAPS Topic: Module C03 Inorganic compounds and solutions.*

*Learning Outcome: 02:02 Describe the differences among acids, bases and salts.*

*Learning Outcome: 02:02 Explain the pH scale.*

*Learning Outcome: 02:03 List the major inorganic chemicals common in cells and explain the function (s) of each.*

*Section: 02.02*

*Section: 02.03*

*Topic: Atoms and molecules*

*Topic: Inorganic compounds and solutions*

92. A complex carbohydrate consists of a phosphate group attached to a sugar molecule.

**FALSE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.02 Explain the relationship between monomers and polymers.*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*HAPS Topic: Module C04 Organic compounds.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

93. Cholesterol, a type of lipid, is composed of 3 fatty acid chains attached to glycerol.

**FALSE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

94. Glycogen is a complex carbohydrate that we get directly by eating plants.

**FALSE**

*Bloom's Level: 1. Remember*

*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*

*HAPS Objective: C04.04d Identify dietary sources of carbohydrates, proteins, lipids and nucleic acids.*

*HAPS Topic: Module C04 Organic compounds.*

*Learning Outcome: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

95. A phospholipid differs structurally from a triglyceride in that it has three phosphate groups attached to the glycerol molecule rather than three fatty acid chains.

**FALSE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

96. Nucleic acids are composed of building blocks called amino acids.

**FALSE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

97. A protein is formed from a sequence of amino acids.

**TRUE**

*Bloom's Level: 2. Understand*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*



101. The opposite of a decomposition reaction is a \_\_\_\_\_ reaction.

**synthesis**

*Bloom's Level: 2. Understand*

*Learning Outcome: 02:02 Describe three types of chemical reactions.*

*Section: 02.02*

*Topic: Atoms and molecules*

102. The midpoint of the pH scale is pH \_\_\_\_.

**7**

*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 C01 Atoms and molecules.*

*Learning Outcome: 02:02 Explain the pH scale.*

*Section: 02.02*

*Topic: Atoms and molecules*

103. Apricots have a pH of 3.8. Therefore, they are \_\_\_\_\_.

**acidic** or

**acid**

*Bloom's Level: 3. Apply*

*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*

*HAPS Topic: Module C01 Atoms and molecules.*

*Learning Outcome: 02:02 Explain the pH scale.*

*Topic: Atoms and molecules*

104. Amino acids are building blocks of \_\_\_\_\_.

**protein**

*Bloom's Level: 1. Remember*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*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: 02:02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Topic: Organic compounds*

Chapter 02 - Chemical Basis of Life

105. The amino acid sequence of a protein is its \_\_\_\_\_ structure.

**primary**

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

106. \_\_\_\_\_ are building blocks of nucleic acids.

**nucleotides**

*Bloom's Level: 1. Remember*

*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*

107. \_\_\_\_ has the unique ability among types of organic molecules to replicate.

**DNA** or

**Deoxyribonucleic acid**

*Bloom's Level: 2. Understand*

*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: 02.02 Describe how atomic structure determines how atoms interact.*

*Learning Outcome: 02:03 Describe the general functions of the main classes of organic molecules in cells.*

*Section: 02.03*

*Topic: Organic compounds*