

TEST BANK



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BIOLOGY



Second Edition

Chapter 02

Test Bank: The Chemical Basis of Life I: Atoms, Molecules, and Water

Multiple Choice Questions

1. These are the smallest functional units of matter that form all chemical substances and that cannot be further broken down by ordinary chemical or physical means.

- A. protons
- B. neutrons
- C. electrons
- D.** atoms
- E. molecules

Bloom's Level: Remember

Section: 2.01

Topic: Chemistry

2. The atomic number of an atom is

- A.** the number of protons in the atom.
- B. the number of neutrons in the atom.
- C. the number of protons and electrons in the atom.
- D. the number of protons and neutrons in the atom.
- E. None of these choices are correct.

Bloom's Level: Remember

Section: 2.01

Topic: Chemistry

3. Which of the following represents the smallest functional unit of living organisms?

- A.** atoms
- B. molecules
- C. proteins
- D. water
- E. salt

Bloom's Level: Remember

Section: 2.01

Topic: Chemistry

4. Oxygen has an atomic mass of 16 and an atomic number of 8.
- A. Oxygen has 16 neutrons.
 - B. Oxygen has 8 electrons.
 - C. Oxygen can form two bonds with other atoms.
 - D. Oxygen has 16 neutrons and 8 electrons.
 - E.** Oxygen has 8 electrons and can form two bonds with other atoms.

Bloom's Level: Apply
Section: 2.01
Topic: Chemistry

5. The nucleus of an atom is composed of
- A. protons.
 - B. neutrons.
 - C. electrons.
 - D.** protons and neutrons.
 - E. protons and electrons.

Bloom's Level: Remember
Section: 2.01
Topic: Chemistry

6. Ernest Rutherford's key experiment on alpha particle bombardment of gold foil was important to the development of
- A. detection methods for protons.
 - B. alpha particle emitters.
 - C. gold as an element.
 - D.** the modern model for atomic structure.
 - E. the concept that atoms have a homogenous distribution of protons throughout the atom.

Bloom's Level: Apply
Section: 2.01
Topic: Chemistry

7. If a scientist were to shoot protons through an atom, for instance like Rutherford did with gold foil, he or she would likely find that
- A.** most of the protons passed straight through the atom.
 - B. few of the protons passed straight through the atom.
 - C. most of the protons deflected or bounced back from the atom.
 - D. most of the protons would be absorbed by the atom.
 - E. All of the choices are correct.

Bloom's Level: Understand
Section: 2.01
Topic: Chemistry

8. The first, inner-most energy shell of an atom
- A. can have a maximum of 8 electrons.
 - B.** can have a maximum of 2 electrons.
 - C. is called the 2p orbital.
 - D. is called the 1s orbital and can have a maximum of 8 electrons.
 - E. is called the 2p orbital and can have a maximum of 2 electrons.

Bloom's Level: Understand
Figure: 2.03
Section: 2.01
Topic: Chemistry

9. If carbon has an atomic mass of 12 and an atomic number of 6 then it has
- A.** 6 electrons.
 - B. 12 electrons.
 - C. 18 electrons.
 - D. as many as 6 but no more than 12.
 - E. None of the choices are correct.

Bloom's Level: Understand
Section: 2.01
Topic: Chemistry

10. Tritiated hydrogen (^3H) differs from hydrogen (^1H) in that
- A. ^3H has 2 more protons than ^1H .
 - B. ^3H has 2 more electrons than ^1H .
 - C.** ^3H has 2 more neutrons than ^1H .
 - D. ^3H has the same number of neutrons as ^1H .
 - E. ^3H has a different electron configuration than ^1H .

Bloom's Level: Apply
Section: 2.01
Topic: Chemistry

11. Isotopes are different forms of the same element that
- A. differ in their number of neutrons.
 - B. have the same numbers of protons.
 - C. are often used in medicine to track biological processes.
 - D. can be found in nature.
 - E.** All the choices are correct.

Bloom's Level: Remember
Section: 2.01
Topic: Chemistry

12. Which of the following represents an abundant element found in living organisms?
- A. calcium.
 - B. iron.
 - C. iodine.
 - D.** hydrogen.
 - E. sodium.

Bloom's Level: Remember
Section: 2.01
Topic: Chemistry

13. Nitrogen has 7 electrons and can form a maximum of _____ bonds with other elements.

- A. 1
- B. 2
- C. 3**
- D. 4
- E. 5

Bloom's Level: Apply
Section: 2.01
Topic: Chemistry

14. Molecules

- A. are derived from the chemical bonding of two or more atoms.
- B. differ in their physical properties from the atoms from which they were derived.
- C. are important to biological processes.
- D. can form from the covalent bonding of two or more atoms.
- E. All the choices are correct.**

Bloom's Level: Understand
Section: 2.02
Topic: Chemistry

15. Which of the following is NOT a molecule?

- A. H₂
- B. H₂O
- C. CH₄
- D. O₂
- E. H**

Bloom's Level: Remember
Section: 2.02
Topic: Chemistry

16. Which of the following represents an ion?

- A.** Ca^{2+}
- B. He
- C. H_2
- D. CO_2
- E. KCl

Bloom's Level: Remember
Section: 2.02
Topic: Chemistry

17. Carbon has 4 electrons and hydrogen has 1 electron in their outer most electron shells. How many bonds can form between a carbon atom and hydrogen atoms?

- A. 0
- B. 1
- C. 2
- D. 3
- E.** 4

Bloom's Level: Apply
Section: 2.02
Topic: Chemistry

18. This is formed when an atom loses an electron to another atom.

- A. polar covalent bond
- B.** cations and anions that can form ionic bonds
- C. covalent bond
- D. hydrogen bond
- E. nonpolar covalent bond

Bloom's Level: Remember
Section: 2.02
Topic: Chemistry

19. Which of the following chemical bonds is the strongest?

- A. hydrogen
- B. Van der Waal forces
- C. hydrophobic interactions
- D. ionic
- E.** covalent

Bloom's Level: Remember

Section: 2.02

Topic: Chemistry

20. What type of bonding is likely to occur between two water molecules or strands of DNA?

- A. covalent
- B. ionic
- C.** hydrogen
- D. both hydrogen and covalent
- E. both hydrogen and ionic

Bloom's Level: Remember

Section: 2.02

Topic: Chemistry

21. Carbon and hydrogen have similar electronegativities and combine together to form hydrocarbon molecules. What type of bonds form between these atoms?

- A. hydrogen
- B. ionic
- C. polar covalent
- D.** nonpolar covalent
- E. electrostatic

Bloom's Level: Understand

Section: 2.02

Topic: Chemistry

22. What type of bonds form from the unequal sharing of electrons?

- A. hydrogen
- B. ionic
- C. polar covalent**
- D. nonpolar covalent
- E. electrostatic

Bloom's Level: Remember

Section: 2.02

Topic: Chemistry

23. In water, MgCl_2 dissociates into Mg^{2+} and Cl^- . Based on this information what type of bond is involved in the formation of MgCl_2 ?

- A. hydrogen
- B. ionic**
- C. polar covalent
- D. nonpolar covalent
- E. electrostatic

Bloom's Level: Apply

Section: 2.02

Topic: Chemistry

24. Which of the following is TRUE of a chemical reaction?

- A. It requires no energy.
- B. It rarely occurs with a catalyst present.
- C. It changes a substance from one form to another.**
- D. It is limited to only a few types of organisms.
- E. They are usually irreversible.

Bloom's Level: Remember

Section: 2.02

Topic: Chemistry

25. When one oxygen atom shares two pairs of electrons with another oxygen atom, O₂ is formed via a(n)

- A. single covalent bond.
- B. double covalent bond.**
- C. triple covalent bond.
- D. ionic bond.
- E. hydrogen bond.

Bloom's Level: Remember

Section: 2.02

Topic: Chemistry

26. Which of the following is LEAST hydrophilic?

- A. Na⁺
- B. HCO₃⁻
- C. oil**
- D. amphipathic molecules
- E. CO₂**Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**

Bloom's Level: Apply

Section: 2.03

Topic: Chemistry

27. Amphipathic molecules

- A. possess only hydrophilic properties.
- B. possess only hydrophobic properties.
- C. possess both hydrophilic and hydrophobic properties.**
- D. possess neither hydrophilic nor hydrophobic properties.
- E. Tend not to interact with other molecules.

Bloom's Level: Remember

Section: 2.03

Topic: Chemistry

28. For water to vaporize
- A. energy must be supplied.
 - B. energy must be released.
 - C. hydrogen bonds are broken.
 - D.** both energy must be supplied and hydrogen bonds broken.
 - E. both energy must be released and hydrogen bonds broken.

Bloom's Level: Understand
Section: 2.03
Topic: Chemistry

29. The molarity of a solution is
- A.** a measure of solute concentration.
 - B. the weight of a solid substance.
 - C. often expressed as grams per unit volume.
 - D. reflects a measure of the amount of oil dissolved in a water.
 - E. a scientific term for determining the solubility of a substance in water.

Bloom's Level: Remember
Section: 2.03
Topic: Chemistry

30. Based on the colligative properties of water, what would happen if one were to add a solute to water?
- A. The freezing point of water would decrease.
 - B. The freezing point of water would increase.
 - C. The boiling point of water would increase.
 - D.** Both the freezing point of water would decrease and the boiling point of water would increase.
 - E. Nothing would change with respect to the freezing point or boiling point of water.

Bloom's Level: Understand
Section: 2.03
Topic: Chemistry

31. Which of the following is *not* true of water?
- A. It is polar.
 - B. It has a high heat of vaporization.
 - C. It has cohesive properties.
 - D. Its evaporation helps regulate body temperature.
 - E.** It is a relatively poor solvent.

Bloom's Level: Understand
Section: 2.03
Topic: Chemistry

32. If orange juice has a pH of 4 then
- A. the H^+ concentration is 4.
 - B.** it is an acidic solution.
 - C. it is an alkaline solution.
 - D. it is an acidic solution with a H^+ concentration of 4.
 - E. None of these choices are correct.

Bloom's Level: Understand
Section: 2.03
Topic: Chemistry

33. pH buffers
- A. minimize fluctuations in the pH of solutions.
 - B. are usually weak acids and bases.
 - C. are common in biological fluids.
 - D. limit major shifts in the amount of H^+ and OH^- in solution.
 - E.** All of the choices are correct.

Bloom's Level: Remember
Section: 2.03
Topic: Chemistry

34. If one were to add a strong acid like HCl to an aqueous solution, which would result?
- A. H^+ would be released into solution.
 - B. The pH would increase.
 - C. The pH would decrease.
 - D. Both H^+ would be released into solution and the pH would increase.
 - E.** Both H^+ would be released into solution and the pH would decrease.

Bloom's Level: Apply
Section: 2.03
Topic: Chemistry

35. Which is true about a pH buffer?
- A. It increases the amount of H^+ in an acidic solution.
 - B.** It reduces the amount of H^+ in an acidic solution.
 - C. It reduces the amount of H^+ in an alkaline solution.
 - D. It increases the amount of OH^- ions in an alkaline solution.
 - E. It reduces the amount of OH^- in an acidic solution.

Bloom's Level: Understand
Section: 2.03
Topic: Chemistry

36. Considering solutions with the following pH, which is alkaline?
- A.** 8
 - B. 7
 - C. 6
 - D. 5
 - E. All are alkaline.

Bloom's Level: Remember
Section: 2.03
Topic: Chemistry

37. Which of the following is TRUE when comparing solutions with a pH of 6 and a pH of 8?
- A. The solution with a pH of 8 has a 100 times higher concentration of hydrogen ions than a solution with a pH of 6.
 - B. The solution with a pH of 8 has a 2 times higher concentration of hydrogen ions than a solution with a pH of 6.
 - C.** The solution with a pH of 8 has a 100 times lower concentration of hydrogen ions than a solution with a pH of 6.
 - D. The solution with a pH of 8 has a 2 times lower concentration of hydrogen ions than a solution with a pH of 6.
 - E. The hydrogen ion concentration does not appreciably differ between a solution with a pH of 8 versus that with a pH of 6.

Bloom's Level: Understand
Section: 2.03

True / False Questions

38. One gram of hydrogen, which has an atomic mass of 1, would have fewer atoms than 1 gram of carbon that has an atomic mass of 12.

FALSE

Bloom's Level: Understand
Section: 2.01
Topic: Chemistry

39. Isotopes are different forms of the same element.

TRUE

Bloom's Level: Understand
Section: 2.01
Topic: Chemistry

40. Sulfur 35 (^{35}S) is an isotope of ^{32}S . These elements differ in their number of neutrons.

TRUE

Bloom's Level: Remember

Section: 2.01

Topic: Chemistry

41. Helium is an inert gas that rarely reacts with other elements because it has the maximum number of valence electrons in its outer shell.

TRUE

Bloom's Level: Understand

Section: 2.02

Topic: Chemistry

42. If lithium has an atomic number of 3 then it will have 1 valence electron.

TRUE

Bloom's Level: Understand

Section: 2.02

Topic: Chemistry

43. The electronegativity of an atom is a measure of its ability to attract electrons to its outer shell from another atom.

TRUE

Bloom's Level: Remember

Section: 2.02

Topic: Chemistry

44. Table salt forms from sodium and chloride via hydrogen bonding.

FALSE

Bloom's Level: Remember

Section: 2.02

Topic: Chemistry

45. Molecules are generally rigid structures and rarely change shape.

FALSE

Bloom's Level: Remember

Section: 2.02

Topic: Chemistry

46. The presence of salt helps prevent oceans from freezing.

TRUE

Bloom's Level: Apply

Section: 2.03

Topic: Chemistry

47. A dehydration reaction that builds larger molecules from smaller units requires the addition of a water molecule.

FALSE

Bloom's Level: Remember

Section: 2.03

Topic: Chemistry

48. The hydroxyl (OH^-) concentration of a solution with a pH of 8 would be 10^{-6} molar.

TRUE

Bloom's Level: Apply

Section: 2.03

Topic: Chemistry

49. Most enzymes or bioactive molecules work effectively within a broad range of pH.

FALSE

Bloom's Level: Understand

Section: 2.03

Topic: Chemistry

50. Buffers minimize fluctuations in the pH of a solution.

TRUE

Bloom's Level: Remember

Section: 2.03

Topic: Chemistry