

TEST BANK

A spiral-bound notebook with a black cover. The text "IMAGE COMING SOON" is printed in white, bold, sans-serif font in the center of the cover. The spiral binding is on the left side.

**IMAGE
COMING
SOON**

CHAPTER 2--LIFE'S CHEMICAL BASIS

Student: _____

1. Toxic elements such as mercury and arsenic are found in the human body because
 - A. of contamination from the environment.
 - B. trace amounts of these elements have vital biological functions.
 - C. they are needed to kill bacteria.
 - D. they may be ingested with food but inactivated by cells.
 - E. in small amounts they are biologically inactive and tolerated by cells.
2. Which is the smallest unit of an element that retains the properties of the element?
 - A. atom
 - B. compound
 - C. ion
 - D. molecule
 - E. mixture
3. Which is NOT an element?
 - A. water
 - B. oxygen
 - C. carbon
 - D. chlorine
 - E. hydrogen
4. The atom found in the greatest amount in the human body, the earth's crust, and seawater is
 - A. hydrogen.
 - B. carbon.
 - C. nitrogen.
 - D. oxygen.
 - E. phosphorus.
5. The atomic number refers to the
 - A. mass of an atom.
 - B. number of protons in an atom.
 - C. number of both protons and neutrons in an atom.
 - D. number of neutrons in an atom.
 - E. number of electrons in an atom.

6. Radioactive isotopes
- A. are electrically unbalanced.
 - B. behave the same chemically and physically but differ biologically from other isotopes.
 - C. are the same physically and biologically but differ from other isotopes chemically.
 - D. have an excess number of neutrons.
 - E. are produced when atoms lose electrons.
7. Which is NOT a compound?
- A. salt
 - B. a carbohydrate
 - C. carbon
 - D. a nucleotide
 - E. methane
8. The subatomic particle(s) with a negative charge is(are)
- A. the neutron.
 - B. the proton.
 - C. the electron.
 - D. both the neutron and proton.
 - E. both the proton and electron.
9. The subatomic particle(s) with a positive charge is(are)
- A. the neutron.
 - B. the proton.
 - C. the electron.
 - D. both the neutron and proton.
 - E. both the proton and electron.
10. The subatomic particle(s) with no charge is(are)
- A. the neutron.
 - B. the proton.
 - C. the electron.
 - D. both the neutron and proton.
 - E. both the proton and electron.
11. The nucleus of an atom contains
- A. neutrons and protons.
 - B. neutrons and electrons.
 - C. protons and electrons.
 - D. protons only.
 - E. neutrons only.

12. Which components of an atom have negative charges?

- I. electrons
- II. protons
- III. neutrons

- A. I only
- B. II only
- C. III only
- D. I and II
- E. II and III

13. Which components of an atom do not have a charge?

- I. electrons
- II. protons
- III. neutrons

- A. I only
- B. II only
- C. III only
- D. I and II
- E. II and III

14. The atomic mass of an atom is determined by the combined masses of its

- A. neutrons and protons.
- B. neutrons and electrons.
- C. protons and electrons.
- D. protons, neutrons, and electrons.
- E. neutrons, nucleus, and electrons.

15. The periodic table of the elements was devised by

- A. Henri Becquerel.
- B. Demitri Mendeleev.
- C. Melvin Calvin.
- D. Marie Curie.
- E. Becquerel and Mendeleev.

16. The atomic number is the number of

- A. neutrons and protons.
- B. neutrons and electrons.
- C. protons and electrons.
- D. protons only.
- E. neutrons only.

17. Which of the following is false concerning the atom in the figure?



- A. The first energy level is full.
 - B. It has an atomic mass of 4.
 - C. It is electrically neutral.
 - D. It has an atomic number of 2.
 - E. It is highly reactive.
18. If the atomic weight of carbon is 12 and the atomic weight of oxygen is 16, the molecular weight of glucose ($C_6H_{12}O_6$) is
- A. 24 grams.
 - B. 28 grams.
 - C. 52 grams.
 - D. 168 grams.
 - E. 180 grams.
19. All atoms of an element have the same number of
- A. ions.
 - B. protons.
 - C. neutrons.
 - D. electrons.
 - E. protons and neutrons.
20. Which of the following statements is NOT true?
- A. All isotopes of an element have the same number of electrons.
 - B. All isotopes of an element have the same number of protons.
 - C. All isotopes of an element have the same number of neutrons.
 - D. All radioactive isotopes are unstable.
 - E. All radioactive isotopes decay into a more stable product.

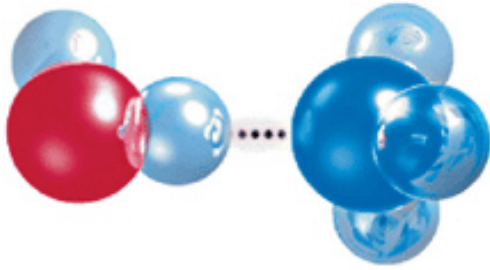
21. Radioactive isotopes have
- excess electrons.
 - excess protons.
 - excess neutrons.
 - insufficient neutrons.
 - insufficient protons.
22. In the chemical shorthand ^{14}C , the 14 represents the number of
- excess neutrons.
 - protons plus neutrons.
 - electrons.
 - protons plus electrons.
 - radioactive particles.
23. In a chemical equation, the chemicals to the left of the arrow are
- products.
 - in greater abundance.
 - at higher energy levels.
 - reactants.
 - all of these
24. Tracers are elements that
- are used in minute amounts in plants.
 - can be monitored through biochemical reactions.
 - must be inert.
 - have an unbalanced electrical charge.
 - must have a stable nucleus.
25. Which statement concerning radioisotope ^{14}C is false?
- It can substitute for ^{12}C in glucose.
 - It has a different number of protons than ^{12}C .
 - It has more neutrons than ^{12}C .
 - It behaves the same chemically as ^{12}C .
 - It has six carbons and eight neutrons.
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- carbon 12.
 - carbon 13.
 - more carbon 14.
 - nitrogen 14.
 - oxygen 14.

27. By analogy, the orbitals and atomic nucleus may be said to most resemble
- A. a merry-go-round.
 - B. a sundial.
 - C. a multilevel apartment building.
 - D. a nest of mixing bowls.
 - E. ripples in a pond.
28. Magnesium has 12 protons. How many electrons are in its third energy level?
- A. 2
 - B. 4
 - C. 6
 - D. 8
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29. Magnesium has 12 protons. How many electrons are in its first energy level?
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30. Magnesium has 12 protons. How many electrons are in its second energy level?
- A. 2
 - B. 4
 - C. 6
 - D. 8
 - E. 10
31. Nitrogen has an atomic number of 7. How many hydrogen atoms are necessary to join with the nitrogen to form a stable compound?
- A. 1
 - B. 2
 - C. 3
 - D. 4
 - E. 5
32. Oxygen, with an atomic number of 8, has ____ electrons in the first energy level and ____ electrons in the second energy level.
- A. 1; 7
 - B. 2; 6
 - C. 3; 5
 - D. 4; 4
 - E. 5; 3

33. Which statement is NOT true?
- A. Electrons closest to the nucleus are at the lowest energy level.
 - B. No more than two electrons can occupy a single orbital.
 - C. Electrons are unable to move out of the assigned orbital space.
 - D. The innermost orbital holds two electrons.
 - E. At the second energy level there are four possible orbitals with a total of eight electrons.
34. Water is an example of a(n)
- A. atom.
 - B. ion.
 - C. compound.
 - D. mixture.
 - E. element.
35. Which includes the other four?
- A. atoms
 - B. molecules
 - C. electrons
 - D. elements
 - E. protons
36. Which statement is false?
- A. A molecule is made of at least two atoms.
 - B. Compounds are made of elements.
 - C. Two atoms of oxygen make a molecule of oxygen.
 - D. Proportions of elements in compounds vary according to their source in nature.
 - E. Elements are found in compounds and molecules.
37. A molecule is
- A. a combination of two or more atoms.
 - B. a mixture of atoms.
 - C. electrically charged.
 - D. a carrier of one or more extra neutrons.
 - E. none of these
38. An atom that gains or loses electrons becomes
- A. more stable.
 - B. an ion.
 - C. a molecule.
 - D. unable to form bonds.
 - E. radioactive.

39. Which of the following is NOT accurate concerning ionization?
- A. When one atom loses electrons, another must gain electrons.
 - B. When an atom loses an electron, it becomes negatively charged.
 - C. Ionic bonds form between ionized atoms.
 - D. In the compound NaCl, Na loses an electron to become positive.
 - E. In an ion, the number of protons and electrons is unequal.
40. The bond in table salt (NaCl) is
- A. polar.
 - B. ionic.
 - C. covalent.
 - D. double.
 - E. nonpolar.
41. In _____ bonds, both atoms exert the same pull on shared electrons.
- A. nonpolar covalent
 - B. polar covalent
 - C. double covalent
 - D. triple covalent
 - E. coordinate covalent
42. Which of these statements is false concerning covalent bonds?
- A. Atoms share electrons.
 - B. Molecules may possess many covalent bonds.
 - C. Water contains polar covalent bonds.
 - D. Covalent bonds may be "double bonds."
 - E. In polar covalent bonds, electrons are shared equally.
43. Electrons are shared in bonds that are
- A. covalent.
 - B. polar.
 - C. nonpolar.
 - D. covalent, polar, or nonpolar.
 - E. covalent, but not polar or nonpolar.

44. The dots in the figure represent a(n)



- A. covalent bond.
 - B. ionic bond.
 - C. hydrogen bond.
 - D. polar covalent bond.
 - E. hydrophobic interaction.
45. A hydrogen bond is a(n)
- A. sharing of a pair of electrons between a hydrogen and an oxygen nucleus.
 - B. sharing of a pair of electrons between a hydrogen nucleus and either an oxygen or a nitrogen nucleus.
 - C. attractive force between a hydrogen atom and either an oxygen or a nitrogen atom that are in other molecules or within the same molecule.
 - D. covalent bond between two hydrogen atoms.
 - E. covalent bond between a hydrogen atom and either an oxygen atom or a nitrogen atom.
46. Which of the following is NOT true of hydrogen bonds?
- A. They are quite weak.
 - B. The hydrogen is slightly positive.
 - C. They are common in macromolecules.
 - D. They are difficult to form and break.
 - E. They always involve hydrogen.
47. Water is important to the interactions of biological molecules because it
- A. promotes hydrophobic and hydrophilic interactions.
 - B. stabilizes temperature.
 - C. is an excellent solvent for polar and ionic substances.
 - D. has strong cohesive properties.
 - E. all of these

48. Hydrophobic molecules are ____ water.
- A. attracted to
 - B. absorbed by
 - C. repelled by
 - D. dissolved by
 - E. polarized by
49. Which of the following is true of water?
- A. The oxygen end is slightly electropositive.
 - B. Hydrogen bonds hold water molecules together.
 - C. Water covers about one-half of the earth's surface.
 - D. It participates in hydrophobic interactions with polar molecules.
 - E. Its solvent properties are greatest with nonpolar molecules.
50. Which of the following is(are) true of water?
- A. It forms spheres of hydration around charged substances and can form hydrogen bonds with many substances.
 - B. It has a high heat-containing property.
 - C. It has cohesive properties.
 - D. It is a liquid at room temperature.
 - E. all of these
51. The oil globules that result when a water and oil mixture is shaken are due to a(n) ____ interaction.
- A. acidic
 - B. basic
 - C. hydrophilic
 - D. hydrophobic
 - E. ionic
52. The most likely reason that glucose dissolves in water is that it is
- A. an ionic compound.
 - B. a polysaccharide.
 - C. polar and forms many hydrogen bonds with the water molecules.
 - D. a very unstable molecule.
 - E. highly nonpolar.
53. The solvent, cohesive, and temperature stabilization properties of water are due to its
- A. ability to promote hydrophilic interactions.
 - B. ionic bonds.
 - C. hydrogen bonds.
 - D. ability to promote hydrophobic interactions.
 - E. nonpolar nature.

54. The change in temperature of a substance is directly related to
- A. the nature of its chemical bonds.
 - B. its reactivity.
 - C. its thermal conductivity.
 - D. the motion of its molecules.
 - E. the mass of its molecules.
55. The column of water extending in tubes from plant roots to leaves is maintained by
- A. cohesion among water molecules.
 - B. ionic bonds.
 - C. covalent bonds.
 - D. hydrophobic interactions.
 - E. hydrophilic interactions.
56. Sodium chloride (NaCl) in water can be described by any EXCEPT which of the following?
- A. Na^+ and Cl^- form
 - B. a solute
 - C. ionized
 - D. forms a hydrophobic interaction
 - E. dissolved
57. A salt will dissolve in water to form
- A. acids.
 - B. hydrogen bonds.
 - C. ions other than H^+ and OH^- .
 - D. bases.
 - E. buffers.
58. A reaction of an acid and a base will produce water and
- A. a buffer.
 - B. a salt.
 - C. release oxygen gas.
 - D. a different acid and base.
 - E. release hydrogen gas.
59. Which of the following is a naked proton?
- A. a hydrogen ion
 - B. an acid
 - C. a base
 - D. a hydroxyl ion
 - E. an oxygen ion

60. "Acidic" is an appropriate description for all EXCEPT which one of the following?
- A. excess hydrogen ions
 - B. the contents of the stomach
 - C. magnesium hydroxide
 - D. HCl
 - E. a pH less than 7
61. A pH of 10 is how many times as basic as a pH of 7?
- A. 2
 - B. 3
 - C. 10
 - D. 100
 - E. 1,000
62. A solution with a pH of 8 has how many times fewer hydrogen ions than a solution with a pH of 6?
- A. 2
 - B. 4
 - C. 10
 - D. 100
 - E. 1,000
63. Which of the following is NOT true?
- A. Acids release hydrogen ions.
 - B. In a neutral solution, the amounts of hydrogen and hydroxyl ions are equal.
 - C. Salts precipitate out of solution and have no function in cells.
 - D. Polar water molecules are attracted to water.
 - E. Hydrogen bonding among water molecules gives water its temperature-stabilizing and cohesive properties.
64. Cellular pH is kept near a value of 7 because of
- A. salts.
 - B. buffers.
 - C. acids.
 - D. bases.
 - E. water.
65. Four of the five answers listed below possess electrons in the third energy level. Select the exception.
- A. sodium
 - B. magnesium
 - C. chlorine
 - D. nitrogen
 - E. sulfur

66. Four of the five answers listed below are related by a unifying characteristic. Select the exception.
- A. ionic bond
 - B. covalent bond
 - C. polar bond
 - D. hydrogen bond
 - E. hydrophilic attraction
67. Four of the five answers listed below are alkaline (pH above 7). Select the exception.
- A. milk of magnesia
 - B. household ammonia
 - C. Tums
 - D. phosphate detergent
 - E. wine
68. Four of the five answers listed below are acidic (pH below 7). Select the exception.
- A. vinegar
 - B. soft drink
 - C. soap
 - D. lemon juice
 - E. beer
69. Four of the five answers listed below are positively charged ions. Select the exception.
- A. potassium ion
 - B. hydrogen ion
 - C. calcium ion
 - D. magnesium ion
 - E. chlorine ion
70. Four of the five answers listed below are characteristics of water. Select the exception.
- A. stabilizes temperature
 - B. is a solvent for ionic and polar substances
 - C. has cohesion and surface tension
 - D. produces salts
 - E. promotes hydrophilic and hydrophobic interactions

CHAPTER 2--LIFE'S CHEMICAL BASIS **Key**

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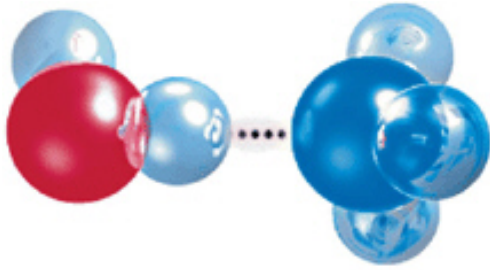
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31. Nitrogen has an atomic number of 7. How many hydrogen atoms are necessary to join with the nitrogen to form a stable compound?
- A. 1
 - B. 2
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32. Oxygen, with an atomic number of 8, has _____ electrons in the first energy level and _____ electrons in the second energy level.
- A. 1; 7
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 - E. ionic
52. The most likely reason that glucose dissolves in water is that it is
- A. an ionic compound.
 - B. a polysaccharide.
 - C. polar and forms many hydrogen bonds with the water molecules.**
 - D. a very unstable molecule.
 - E. highly nonpolar.
53. The solvent, cohesive, and temperature stabilization properties of water are due to its
- A. ability to promote hydrophilic interactions.
 - B. ionic bonds.
 - C. hydrogen bonds.**
 - D. ability to promote hydrophobic interactions.
 - E. nonpolar nature.

54. The change in temperature of a substance is directly related to
- A. the nature of its chemical bonds.
 - B. its reactivity.
 - C. its thermal conductivity.
 - D.** the motion of its molecules.
 - E. the mass of its molecules.
55. The column of water extending in tubes from plant roots to leaves is maintained by
- A.** cohesion among water molecules.
 - B. ionic bonds.
 - C. covalent bonds.
 - D. hydrophobic interactions.
 - E. hydrophilic interactions.
56. Sodium chloride (NaCl) in water can be described by any EXCEPT which of the following?
- A. Na⁺ and Cl⁻ form
 - B. a solute
 - C. ionized
 - D.** forms a hydrophobic interaction
 - E. dissolved
57. A salt will dissolve in water to form
- A. acids.
 - B. hydrogen bonds.
 - C.** ions other than H⁺ and OH⁻.
 - D. bases.
 - E. buffers.
58. A reaction of an acid and a base will produce water and
- A. a buffer.
 - B.** a salt.
 - C. release oxygen gas.
 - D. a different acid and base.
 - E. release hydrogen gas.
59. Which of the following is a naked proton?
- A.** a hydrogen ion
 - B. an acid
 - C. a base
 - D. a hydroxyl ion
 - E. an oxygen ion

60. "Acidic" is an appropriate description for all EXCEPT which one of the following?
- A. excess hydrogen ions
 - B. the contents of the stomach
 - C.** magnesium hydroxide
 - D. HCl
 - E. a pH less than 7
61. A pH of 10 is how many times as basic as a pH of 7?
- A. 2
 - B. 3
 - C. 10
 - D. 100
 - E.** 1,000
62. A solution with a pH of 8 has how many times fewer hydrogen ions than a solution with a pH of 6?
- A. 2
 - B. 4
 - C. 10
 - D.** 100
 - E. 1,000
63. Which of the following is NOT true?
- A. Acids release hydrogen ions.
 - B. In a neutral solution, the amounts of hydrogen and hydroxyl ions are equal.
 - C.** Salts precipitate out of solution and have no function in cells.
 - D. Polar water molecules are attracted to water.
 - E. Hydrogen bonding among water molecules gives water its temperature-stabilizing and cohesive properties.
64. Cellular pH is kept near a value of 7 because of
- A. salts.
 - B.** buffers.
 - C. acids.
 - D. bases.
 - E. water.
65. Four of the five answers listed below possess electrons in the third energy level. Select the exception.
- A. sodium
 - B. magnesium
 - C. chlorine
 - D.** nitrogen
 - E. sulfur

66. Four of the five answers listed below are related by a unifying characteristic. Select the exception.
- A. ionic bond
 - B. covalent bond
 - C. polar bond
 - D. hydrogen bond
 - E.** hydrophilic attraction
67. Four of the five answers listed below are alkaline (pH above 7). Select the exception.
- A. milk of magnesia
 - B. household ammonia
 - C. Tums
 - D. phosphate detergent
 - E.** wine
68. Four of the five answers listed below are acidic (pH below 7). Select the exception.
- A. vinegar
 - B. soft drink
 - C.** soap
 - D. lemon juice
 - E. beer
69. Four of the five answers listed below are positively charged ions. Select the exception.
- A. potassium ion
 - B. hydrogen ion
 - C. calcium ion
 - D. magnesium ion
 - E.** chlorine ion
70. Four of the five answers listed below are characteristics of water. Select the exception.
- A. stabilizes temperature
 - B. is a solvent for ionic and polar substances
 - C. has cohesion and surface tension
 - D.** produces salts
 - E. promotes hydrophilic and hydrophobic interactions