2

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

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.

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

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

4. Oxygen has an atomic mass of 16 and an atomic number of 8, therefore

   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.

5. The nucleus of an atom is composed of

   A. protons.

   B. neutrons.

   C. electrons.

   D. protons and neutrons.

   E. protons and electrons.

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.

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.

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.

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 electrons.
   E. None of the choices are correct.

10. Tritiated hydrogen (^{3}H) differs from hydrogen (^{1}H) in that

    A. ^{3}H has 2 more protons than ^{1}H.

    B. ^{3}H has 2 more electrons than ^{1}H.

    C. ^{3}H has 2 more neutrons than ^{1}H.

    D. ^{3}H has the same number of neutrons as ^{1}H.

    E. ^{3}H has a different electron configuration than ^{1}H.

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.

12. Which of the following represents an abundant element found in living organisms?

    A. calcium.

    B. iron.

    C. iodine.

    D. hydrogen.

    E. sodium.

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

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.

15. Which of the following is NOT a molecule?

A. H_2

B. H_2O

C. CH_4

D. O_2

E. H

16. Which of the following represents an ion?

A. Ca^{2+}

B. He

C. H_2

D. CO_2

E. KCl

17. Carbon has 4 electrons and hydrogen has 1 electron in its 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

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

19. Which of the following chemical bonds is based on the sharing of a pair of electrons?

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

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

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

22. What type of bond is formed by the unequal sharing of electrons?

A. hydrogen

B. ionic

C. polar covalent

D. nonpolar covalent

E. electrostatic

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

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. It is usually irreversible.

25. When one oxygen atom shares two pairs of electrons with another oxygen atom, then O_2 is formed through a(n)

A. single covalent bond.

B. double covalent bond.

C. triple covalent bond.

D. ionic bond.

E. hydrogen bond.

26. Which of the following is LEAST hydrophilic?

A. Na^+

B. HCO_3^-

C. Oil

D. Amphipathic molecules

E. CO_2

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. do not tend to interact with other molecules.

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.

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 water.

E. a scientific term for determining the solubility of a substance in water.

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. 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.

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.

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 an H^+ concentration of 4.

E. None of these choices are correct.

33. The most significant role played by pH buffers is to

A. prevent fluctuations in the acidity of solutions.

B. increase the strength of acids and bases.

C. prevent fluctuations in the salinity of solutions.

D. limit major shifts in the amount of H^+ and OH^- in solution.

E. keep pH low.

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 but the concentration of H^+ would remain the same.

C. The pH would remain same but the concentration of H^+ 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.

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.

36. Considering solutions with the following pH, which is alkaline?

A. 8

B. 7

C. 6

D. 5

E. All are alkaline.

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.

38. Which would you expect to have a lower freezing temperature: solution A (50 mM NaCl and 25 mM sucrose) or solution B (40 mM NaCl and 25 mM sucrose)?

A. Solution A because it has a higher total solute concentration.
B. Solution B because it has a lower total solute concentration.
C. The freezing temperature would not differ because the concentration of sucrose does not differ.
D. Solution A because it has a higher concentration of NaCl.
E. Solution B because it has a lower concentration of NaCl.

39. Which of the following statements regarding hydrogen bonds is correct?

A. Hydrogen bonds form only between carbon and hydrogen atoms.

B. Individual hydrogen bonds are weak but collectively can be quite strong.

C. Only nonpolar molecules will form hydrogen bonds.

D. Hydrogen bonds form only between two hydrogen atoms.

E. Hydrogen bonds involve the sharing of a pair of electrons.

40. Which of the following molecules would be the LEAST likely to participate in hydrogen bonding with another molecule?

A. H_2O

B. C^2H_4

C. $C_2H_4O_2$

D. $C_3H_6O_2$

E. $C_4H_8O_2$

41. Based on the colligative properties of water, how might increasing the concentration of solutes in its blood help a fish survive in cold water?

A. The solutes will generate heat.

B. The freezing point of the fish's blood will be raised.

C. The freezing point of the fish's blood will be lowered.

D. The fish will exchange more heat with its environment.

E. Increasing the concentration of solutes in blood will not help the fish to survive cold water.

42. Imagine that you have been studying the physical interaction between a drug and the protein in a cell that the drug targets. Your analysis indicates that the drug interacts with the protein through hydrogen bonds, dipole-dipole interactions, and ion-dipole interactions. Collectively, you could describe the drug/protein interaction as being due to

A. ionic bonding.

B. covalent bonding.

C. van der Waals forces.

D. both ionic and covalent bonding.

E. There is not enough information to answer this question.

43. You notice that the majority of the electrons in NaCl spend their time around the chlorine. You also notice that the electrons in H2 are evenly distributed among the two atoms. Which two types of bonds are represented in these molecules?

A. Covalent bonds in NaCl; ionic bonds in H2.

B. Covalent bonds in NaCl; covalent bonds in H2.

C. Ionic bonds in NaCl; ionic bonds in H2.

D. Ionic bonds in NaCl; covalent bonds in H2.

E. No bonds can be formed in NaCl and in H2.

44. A bottle of sodium in solution and a bottle of chloride in solution are mixed together. What type of bond will be created between the atoms, and what will be the product?

A. Covalent bonds; sodium chlorine

B. Ionic bonds; table salt

C. Hydrogen bonds; sodium hydroxide

D. Carbon bonds; carboxyl groups

E. Covalent bonds; disodium chorine

45. You've been asked to stabilize a compound whose general state is altered by excess electrons. The element you would add to the compound to most effectively stabilize the compound would be what? Why?

A. Carbon, because it is capable of neutralizing electrons.

B. Nitrogen, because it has five electrons on its outer shell.

C. Fluorine, because it is the most electronegative element in the periodic table.

D. Oxygen, because it can easily bind with the compound.

E. Oxygen, because it is capable of neutralizing electrons.

46. Five unknown compounds are added to water. Four of the compounds dissolve in the solution while one does not. What property does water possess that allows these four compounds to dissolve? Why might the fifth compound not dissolve?

A. The positive and negative charge in water will dissolve many substances; the substance is not structurally similar to water.
B. The negative charge of water dissolves many substances; the substance is too structurally similar to water.
C. The positive charge of water dissolves many substances; the substance is too structurally similar to water.
D. The nonpolar qualities of water dissolve many substances; the substance is not structurally similar to water.
E. The neutrality of water dissolves many substances; the substance is too structurally similar to water.

47. 1 mole = 1000 millimoles (mmol); 1millimole = 1000 micromoles (μmol). If a solution contains 38231 μmol, what is that amount in mmol?

A. 382.31 mmol
B. 38.231 mmol
C. 3.8231 mmol
D. 3823.1 mmol
E. 0.38231 mmol

48. If 1000 millimoles make up a mole, how many grams of magnesium (Mg), which has an atomic mass of 24.305, will make a solution of 150 μmol?

A. 3.6 mg

B. 2.4 mg

C. 0.24 mg

D. 36 mg

E. 24 mg

49. Using the periodic table as your tool, identify the atomic characteristic that would most quickly and efficiently identify any single element:

A. number of shells

B. number of neutrons

C. number of protons and electrons

D. number of neutrons and electrons

E. number of electrons

50. You have been asked to synthesize a new isotope for cadmium. Which part of the original atom would you need to manipulate in order to create an isotope?

A. Neutrons

B. Protons

C. Protons and neutrons

D. Electrons

E. Neutrons, protons, and electrons

51. Water has fewer hydrogen atoms than lemon juice and a pH of around 7. Predict what will happen to the pH level of water when lemon juice is added.

A. The pH will become higher.
B. The pH will become lower.
C. The pH will remain the same.
D. The pH will increase to 14.
E. There is not enough information to decide.

52. 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.

True False

53. Isotopes are different forms of the same element.

True False

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

True False

55. 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 False

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

True False

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

True False

58. Table salt is formed through hydrogen bonding of sodium and chloride.

True False

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

True False

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

True False

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

True False

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

True False

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

True False

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

True False

2 Key

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

Blooms: Remember
Brooker - Chapter 02 #1
Difficulty: Easy
Learning Objective: 02-01-01 Understand the general structure of atoms and their constituent particles.
Section: 2.1
Topic: Atoms

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.

Blooms: Remember
Brooker - Chapter 02 #2
Difficulty: Easy
Learning Objective: 02-01-01 Understand the general structure of atoms and their constituent particles.

Section: 2.1

Topic: Atoms

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

A. atoms

B. molecules

C. proteins

D. water

E. salt

Blooms: Remember

Brooker - Chapter 02 #3

Difficulty: Easy

Learning Objective: 02-01-01 Understand the general structure of atoms and their constituent particles.

Section: 2.1

Topic: Atoms

4. Oxygen has an atomic mass of 16 and an atomic number of 8, therefore

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.

Blooms: Apply

Brooker - Chapter 02 #4

Difficulty: Easy

Learning Objective: 02-01-01 Understand the general structure of atoms and their constituent particles.

Section: 2.1

Topic: Atoms

5. The nucleus of an atom is composed of

A. protons.

B. neutrons.

C. electrons.

D. protons and neutrons.

E. protons and electrons.

Blooms: Remember

Brooker - Chapter 02 #5

Difficulty: Easy

Learning Objective: 02-01-01 Understand the general structure of atoms and their constituent particles.

Section: 2.1

Topic: Atoms

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.

Blooms: Understand

Brooker - Chapter 02 #6

Difficulty: Moderate

Learning Objective: 02-01-02 Discuss the way electrons orbit the nucleus of an atom within discrete energy levels.

Section: 2.1

Topic: Atoms

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.

Blooms: Understand

Brooker - Chapter 02 #7

Difficulty: Moderate

Learning Objective: 02-01-02 Discuss the way electrons orbit the nucleus of an atom within discrete energy levels.

Section: 2.1

Topic: Atoms

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.

Blooms: Remember

Brooker - Chapter 02 #8

Difficulty: Easy

Learning Objective: 02-01-02 Discuss the way electrons orbit the nucleus of an atom within discrete energy levels.

Section: 2.1

Topic: Atoms

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 electrons.

E. None of the choices are correct.

Blooms: Understand

Brooker - Chapter 02 #9

Difficulty: Moderate

Learning Objective: 02-01-03 Relate atomic structure to the periodic table of the elements.

Section: 2.1

Topic: Atoms

10. Tritiated hydrogen (^{3}H) differs from hydrogen (^{1}H) in that

A. ^{3}H has 2 more protons than ^{1}H.

B. ^{3}H has 2 more electrons than ^{1}H.

C. ^{3}H has 2 more neutrons than ^{1}H.

D. ^{3}H has the same number of neutrons as ^{1}H.

E. ^{3}H has a different electron configuration than ^{1}H.

Blooms: Remember

Brooker - Chapter 02 #10

Difficulty: Moderate

Learning Objective: 02-01-05 Explain how a single element may exist in more than one form; called isotopes; and how certain isotopes have importance in human medicine.

Section: 2.1

Topic: Atoms

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.

Blooms: Understand

Brooker - Chapter 02 #11

Difficulty: Moderate

Learning Objective: 02-01-05 Explain how a single element may exist in more than one form; called isotopes; and how certain isotopes have importance in human medicine.

Section: 2.1

Topic: Atoms

12. Which of the following represents an abundant element found in living organisms?

A. calcium.

B. iron.

C. iodine.

D. hydrogen.

E. sodium.

Blooms: Remember

Brooker - Chapter 02 #12

Difficulty: Moderate

Learning Objective: 02-01-06 Know which elements compose most of the mass of all living organisms.

Section: 2.1

Topic: Atoms

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

Blooms: Apply

Brooker - Chapter 02 #13

Difficulty: Easy

Learning Objective: 02-01-02 Discuss the way electrons orbit the nucleus of an atom within discrete energy levels.

Section: 2.1

Topic: Atoms

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.

Blooms: Remember

Brooker - Chapter 02 #14

Difficulty: Easy

Learning Objective: 02-02-01 Compare and contrast the types of atomic interactions that lead to the formation of molecules.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

15. Which of the following is NOT a molecule?

A. H_2

B. H_2O

C. CH_4

D. O_2

E. H

Blooms: Remember

Brooker - Chapter 02 #15

Difficulty: Easy

Learning Objective: 02-02-01 Compare and contrast the types of atomic interactions that lead to the formation of molecules.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

16. Which of the following represents an ion?

A. Ca^{2+}

B. He

C. H_2

D. CO_2

E. KCl

Blooms: Remember

Brooker - Chapter 02 #16

Difficulty: Easy

Learning Objective: 02-01-02 Discuss the way electrons orbit the nucleus of an atom within discrete energy levels.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

17. Carbon has 4 electrons and hydrogen has 1 electron in its 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

Blooms: Apply

Brooker - Chapter 02 #17

Difficulty: Easy

Learning Objective: 02-02-01 Compare and contrast the types of atomic interactions that lead to the formation of molecules.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

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

Blooms: Remember

Brooker - Chapter 02 #18

Difficulty: Moderate

Learning Objective: 02-02-01 Compare and contrast the types of atomic interactions that lead to the formation of molecules.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

19. Which of the following chemical bonds is based on the sharing of a pair of electrons?

A. hydrogen

B. Van der Waal forces

C. hydrophobic interactions

D. ionic

E. covalent

Blooms: Remember

Brooker - Chapter 02 #19

Difficulty: Easy

Learning Objective: 02-02-01 Compare and contrast the types of atomic interactions that lead to the formation of molecules.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

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

Blooms: Understand

Brooker - Chapter 02 #20

Difficulty: Moderate

Learning Objective: 02-02-02 Explain the concept of electronegativity and its contribution to the polarity of some covalent bonds.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

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

Blooms: Understand

Brooker - Chapter 02 #21

Difficulty: Moderate

Learning Objective: 02-02-02 Explain the concept of electronegativity and its contribution to the polarity of some covalent bonds.

Section: 2.2

Topic: Chemical forces that create and stabilize molecules

22. What type of bond is formed by the unequal sharing of electrons?

A. hydrogen

B. ionic

C. polar covalent

D. nonpolar covalent

E. electrostatic

Blooms: Remember

Brooker - Chapter 02 #22

Difficulty: Easy

Learning Objective: 02-02-02 Explain the concept of electronegativity and its contribution to the polarity of some covalent bonds.

Section: 2.2

Topic: Chemical forces that create and stabilize molecules

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

Blooms: Apply

Brooker - Chapter 02 #23

Difficulty: Moderate

Learning Objective: 02-02-02 Explain the concept of electronegativity and its contribution to the polarity of some covalent bonds.

Section: 2.2

Topic: Chemical forces that create and stabilize molecules

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. It is usually irreversible.

Blooms: Understand

Brooker - Chapter 02 #24

Difficulty: Moderate

Learning Objective: 02-02-03 Understand the concepts of a chemical reaction and chemical equilibrium.

Section: 2.2

Topic: Chemical forces that create and stabilize molecules

25. When one oxygen atom shares two pairs of electrons with another oxygen atom, then O_2 is formed through a(n)

A. single covalent bond.

B. double covalent bond.

C. triple covalent bond.

D. ionic bond.

E. hydrogen bond.

Blooms: Remember

Brooker - Chapter 02 #25

Difficulty: Easy

Learning Objective: 02-02-03 Understand the concepts of a chemical reaction and chemical equilibrium.

Section: 2.2

Topic: Chemical forces that create and stabilize molecules

26. Which of the following is LEAST hydrophilic?

A. Na^+

B. HCO_3^-

C. Oil

D. Amphipathic molecules

E. CO_2

Blooms: Understand

Brooker - Chapter 02 #26

Difficulty: Moderate

Learning Objective: 02-04-02 List the properties of water that make it a valuable solvent; and distinguish between hydrophilic and hydrophobic substances.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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. do not tend to interact with other molecules.

Blooms: Remember

Brooker - Chapter 02 #27

Difficulty: Easy

Learning Objective: 02-04-02 List the properties of water that make it a valuable solvent; and distinguish between hydrophilic and hydrophobic substances.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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.

Blooms: Understand

Brooker - Chapter 02 #28

Difficulty: Moderate

Learning Objective: 02-04-02 List the properties of water that make it a valuable solvent; and distinguish between hydrophilic and hydrophobic substances.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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 water.

E. a scientific term for determining the solubility of a substance in water.

Blooms: Remember

Brooker - Chapter 02 #29

Difficulty: Easy

Learning Objective: 02-04-03 Understand how the molarity of a solution-the number of moles of a solute per litre of solution-is used to measure the concentration of solutes in solution.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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. 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.

Blooms: Apply

Brooker - Chapter 02 #30

Difficulty: Moderate

Learning Objective: 02-04-04 Discuss the properties of water that are critical for the survival of living organisms.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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.

Blooms: Understand

Brooker - Chapter 02 #31

Difficulty: Moderate

Learning Objective: 02-04-02 List the properties of water that make it a valuable solvent; and distinguish between hydrophilic and hydrophobic substances.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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 an H^+ concentration of 4.

E. None of these choices are correct.

Blooms: Apply

Brooker - Chapter 02 #32

Difficulty: Easy

Learning Objective: 02-04-05 Explain how water has the ability to ionize into hydroxide ions (OH-) and into hydrogen ions (H+); and how the H+ concentration is expressed as a solutions pH.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

33. The most significant role played by pH buffers is to

A. prevent fluctuations in the acidity of solutions.

B. increase the strength of acids and bases.

C. prevent fluctuations in the salinity of solutions.

D. limit major shifts in the amount of H^+ and OH^- in solution.

E. keep pH low.

Blooms: Evaluate

Brooker - Chapter 02 #33

Difficulty: Easy

Learning Objective: 02-04-06 Give examples of how buffers maintain a stable environment in an animals body fluids.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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 but the concentration of H^+ would remain the same.

C. The pH would remain same but the concentration of H^+ 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.

Blooms: Apply

Brooker - Chapter 02 #34

Difficulty: Moderate

Learning Objective: 02-04-05 Explain how water has the ability to ionize into hydroxide ions (OH-) and into hydrogen ions (H+); and how the H+ concentration is expressed as a solutions pH.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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.

Blooms: Understand

Brooker - Chapter 02 #35

Difficulty: Moderate

Learning Objective: 02-04-06 Give examples of how buffers maintain a stable environment in an animals body fluids.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

36. Considering solutions with the following pH, which is alkaline?

A. 8

B. 7

C. 6

D. 5

E. All are alkaline.

Blooms: Understand

Brooker - Chapter 02 #36

Difficulty: Moderate

Learning Objective: 02-04-05 Explain how water has the ability to ionize into hydroxide ions (OH-) and into hydrogen ions (H+); and how the H+ concentration is expressed as a solutions pH.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

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.

Blooms: Analyze

Brooker - Chapter 02 #37

Difficulty: Moderate

Learning Objective: 02-04-05 Explain how water has the ability to ionize into hydroxide ions (OH-) and into hydrogen ions (H+); and how the H+ concentration is expressed as a solutions pH.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

38. Which would you expect to have a lower freezing temperature: solution A (50 mM NaCl and 25 mM sucrose) or solution B (40 mM NaCl and 25 mM sucrose)?

A. Solution A because it has a higher total solute concentration.

B. Solution B because it has a lower total solute concentration.

C. The freezing temperature would not differ because the concentration of sucrose does not differ.

D. Solution A because it has a higher concentration of NaCl.

E. Solution B because it has a lower concentration of NaCl.

Blooms: Apply

Brooker - Chapter 02 #38

Difficulty: Moderate

Learning Objective: 02-04-02 List the properties of water that make it a valuable solvent; and distinguish between hydrophilic and hydrophobic substances.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

39. Which of the following statements regarding hydrogen bonds is correct?

A. Hydrogen bonds form only between carbon and hydrogen atoms.

B. Individual hydrogen bonds are weak but collectively can be quite strong.

C. Only nonpolar molecules will form hydrogen bonds.

D. Hydrogen bonds form only between two hydrogen atoms.

E. Hydrogen bonds involve the sharing of a pair of electrons.

Blooms: Understand

Brooker - Chapter 02 #39

Difficulty: Moderate

Learning Objective: 02-03-02 Understand the nature of hydrogen bonds and how they form in living systems.

Section: 2.3

Topic: Chemical forces that promote and stabilize molecular interactions

40. Which of the following molecules would be the LEAST likely to participate in hydrogen bonding with another molecule?

A. H_2O

B. C^2H_4

C. $C_2H_4O_2$

D. $C_3H_6O_2$

E. $C_4H_8O_2$

Blooms: Understand

Brooker - Chapter 02 #40

Difficulty: Moderate

Learning Objective: 02-03-02 Understand the nature of hydrogen bonds and how they form in living systems.

Section: 2.3

Topic: Chemical forces that promote and stabilize molecular interactions

41. Based on the colligative properties of water, how might increasing the concentration of solutes in its blood help a fish survive in cold water?

A. The solutes will generate heat.

B. The freezing point of the fish's blood will be raised.

C. The freezing point of the fish's blood will be lowered.

D. The fish will exchange more heat with its environment.

E. Increasing the concentration of solutes in blood will not help the fish to survive cold water.

Blooms: Understand

Brooker - Chapter 02 #41

Difficulty: Moderate

Learning Objective: 02-04-04 Discuss the properties of water that are critical for the survival of living organisms.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

42. Imagine that you have been studying the physical interaction between a drug and the protein in a cell that the drug targets. Your analysis indicates that the drug interacts with the protein through hydrogen bonds, dipole-dipole interactions, and ion-dipole interactions. Collectively, you could describe the drug/protein interaction as being due to

A. ionic bonding.

B. covalent bonding.

C. van der Waals forces.

D. both ionic and covalent bonding.

E. There is not enough information to answer this question.

Blooms: Apply

Brooker - Chapter 02 #42

Difficulty: Moderate

Learning Objective: 02-03-01 Compare and contrast covalent and ionic bonds with ion-dipole and dipole-dipole interactions.

Section: 2.3

Topic: Chemical forces that promote and stabilize molecular interactions

43. You notice that the majority of the electrons in NaCl spend their time around the chlorine. You also notice that the electrons in H2 are evenly distributed among the two atoms. Which two types of bonds are represented in these molecules?

A. Covalent bonds in NaCl; ionic bonds in H2.

B. Covalent bonds in NaCl; covalent bonds in H2.

C. Ionic bonds in NaCl; ionic bonds in H2.

D. Ionic bonds in NaCl; covalent bonds in H2.

E. No bonds can be formed in NaCl and in H2.

Blooms: Analyze

Brooker - Chapter 02 #43

Difficulty: Moderate

Learning Objective: 02-02-01 Compare and contrast the types of atomic interactions that lead to the formation of molecules.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

44. A bottle of sodium in solution and a bottle of chloride in solution are mixed together. What type of bond will be created between the atoms, and what will be the product?

A. Covalent bonds; sodium chlorine

B. Ionic bonds; table salt

C. Hydrogen bonds; sodium hydroxide

D. Carbon bonds; carboxyl groups

E. Covalent bonds; disodium chorine

Blooms: Analyze

Brooker - Chapter 02 #44

Difficulty: Moderate

Learning Objective: 02-02-01 Compare and contrast the types of atomic interactions that lead to the formation of molecules.

Section: 2.2

Topic: Chemical bonds that create and stabilize molecules

45. You've been asked to stabilize a compound whose general state is altered by excess electrons. The element you would add to the compound to most effectively stabilize the compound would be what? Why?

A. Carbon, because it is capable of neutralizing electrons.

B. Nitrogen, because it has five electrons on its outer shell.

C. Fluorine, because it is the most electronegative element in the periodic table.

D. Oxygen, because it can easily bind with the compound.

E. Oxygen, because it is capable of neutralizing electrons.

Blooms: Apply

Brooker - Chapter 02 #45

Difficulty: Difficult

Learning Objective: 02-01-03 Relate atomic structure to the periodic table of the elements.

Section: 2.1

Topic: Atoms

46. Five unknown compounds are added to water. Four of the compounds dissolve in the solution while one does not. What property does water possess that allows these four compounds to dissolve? Why might the fifth compound not dissolve?

A. The positive and negative charge in water will dissolve many substances; the substance is not structurally similar to water.
B. The negative charge of water dissolves many substances; the substance is too structurally similar to water.
C. The positive charge of water dissolves many substances; the substance is too structurally similar to water.
D. The nonpolar qualities of water dissolve many substances; the substance is not structurally similar to water.
E. The neutrality of water dissolves many substances; the substance is too structurally similar to water.

Blooms: Apply

Brooker - Chapter 02 #46

Difficulty: Moderate

Learning Objective: 02-04-02 List the properties of water that make it a valuable solvent; and distinguish between hydrophilic and hydrophobic substances.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

47. 1 mole = 1000 millimoles (mmol); 1millimole = 1000 micromoles (µmol). If a solution contains 38231 µmol, what is that amount in mmol?

A. 382.31 mmol

B. 38.231 mmol

C. 3.8231 mmol

D. 3823.1 mmol

E. 0.38231 mmol

Blooms: Apply

Brooker - Chapter 02 #47

Difficulty: Moderate

Learning Objective: 02-04-03 Understand how the molarity of a solution-the number of moles of a solute per litre of solution-is used to measure the concentration of solutes in solution.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

48. If 1000 millimoles make up a mole, how many grams of magnesium (Mg), which has an atomic mass of 24.305, will make a solution of 150 µmol?

A. 3.6 mg

B. 2.4 mg

C. 0.24 mg

D. 36 mg

E. 24 mg

Blooms: Apply

Brooker - Chapter 02 #48

Difficulty: Moderate

Learning Objective: 02-04-03 Understand how the molarity of a solution-the number of moles of a solute per litre of solution-is used to measure the concentration of solutes in solution.

Section: 2.4

Topic: The importance of water and its physical and chemical properties

49. Using the periodic table as your tool, identify the atomic characteristic that would most quickly and efficiently identify any single element:

A. number of shells
B. number of neutrons
C. number of protons and electrons
D. number of neutrons and electrons
E. number of electrons

Blooms: Apply
Brooker - Chapter 02 #49
Difficulty: Moderate
Learning Objective: 02-01-03 Relate atomic structure to the periodic table of the elements.
Section: 2.1
Topic: Atoms

50. You have been asked to synthesize a new isotope for cadmium. Which part of the original atom would you need to manipulate in order to create an isotope?

A. Neutrons
B. Protons
C. Protons and neutrons
D. Electrons
E. Neutrons, protons, and electrons

Blooms: Apply
Brooker - Chapter 02 #50
Difficulty: Moderate
Learning Objective: 02-01-05 Explain how a single element may exist in more than one form; called isotopes; and how certain isotopes have importance in human medicine.
Section: 2.1
Topic: Atoms

51. Water has fewer hydrogen atoms than lemon juice and a pH of around 7. Predict what will happen to the pH level of water when lemon juice is added.

A. The pH will become higher.

B. The pH will become lower.

C. The pH will remain the same.

D. The pH will increase to 14.

E. There is not enough information to decide.

Blooms: Apply
Brooker - Chapter 02 #51
Difficulty: Moderate
Learning Objective: 02-04-05 Explain how water has the ability to ionize into hydroxide ions (OH-) and into hydrogen ions (H+); and how the H+ concentration is expressed as a solutions pH.
Section: 2.4
Topic: The importance of water and its physical and chemical properties

52. 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

Blooms: Understand
Brooker - Chapter 02 #52
Difficulty: Moderate
Learning Objective: 02-01-02 Discuss the way electrons orbit the nucleus of an atom within discrete energy levels.
Section: 2.1
Topic: Atoms

53. Isotopes are different forms of the same element.

TRUE

Blooms: Remember

Brooker - Chapter 02 #53

Difficulty: Easy

Learning Objective: 02-01-05 Explain how a single element may exist in more than one form; called isotopes; and how certain isotopes have importance in human medicine.

Section: 2.1

Topic: Atoms

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

TRUE

Blooms: Remember

Brooker - Chapter 02 #54

Difficulty: Easy

Learning Objective: 02-01-05 Explain how a single element may exist in more than one form; called isotopes; and how certain isotopes have importance in human medicine.

Section: 2.1

Topic: Atoms

55. 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

Blooms: Understand

Brooker - Chapter 02 #55

Difficulty: Easy

Learning Objective: 02-01-02 Discuss the way electrons orbit the nucleus of an atom within discrete energy levels.

Section: 2.1

Topic: Atoms

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

TRUE

Blooms: Understand

Brooker - Chapter 02 #56

Difficulty: Moderate

Learning Objective: 02-01-02 Discuss the way electrons orbit the nucleus of an atom within discrete energy levels.

Section: 2.1

Topic: Atoms

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

TRUE

Blooms: Remember

Brooker - Chapter 02 #57

Difficulty: Easy

Learning Objective: 02-02-02 Explain the concept of electronegativity and its contribution to the polarity of some covalent bonds.

Section: 2.2

Topic: Chemical forces that create and stabilize molecules

58. Table salt is formed through hydrogen bonding of sodium and chloride.

FALSE

Blooms: Remember

Brooker - Chapter 02 #58

Difficulty: Easy

Learning Objective: 02-02-02 Explain the concept of electronegativity and its contribution to the polarity of some covalent bonds.

Section: 2.2

Topic: Chemical forces that create and stabilize molecules

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

FALSE

Blooms: Remember

Brooker - Chapter 02 #59

Difficulty: Easy

Learning Objective: 02-02-01 Compare and contrast the types of atomic interactions that lead to the formation of molecules.

Section: 2.2

Topic: Chemical forces that create and stabilize molecules

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

TRUE

Blooms: Understand
Brooker - Chapter 02 #60
Difficulty: Moderate
Learning Objective: 02-04-04 Discuss the properties of water that are critical for the survival of living organisms.
Section: 2.4
Topic: The importance of water and its physical and chemical properties

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

FALSE

Blooms: Remember
Brooker - Chapter 02 #61
Difficulty: Moderate
Learning Objective: 02-04-06 Give examples of how buffers maintain a stable environment in an animals body fluids.
Section: 2.4
Topic: The importance of water and its physical and chemical properties

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

TRUE

Blooms: Apply
Brooker - Chapter 02 #62
Difficulty: Moderate
Learning Objective: 02-04-05 Explain how water has the ability to ionize into hydroxide ions (OH-) and into hydrogen ions (H+); and how the H+ concentration is expressed as a solutions pH.
Section: 2.4
Topic: The importance of water and its physical and chemical properties

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

FALSE

Blooms: Understand
Brooker - Chapter 02 #63
Difficulty: Moderate
Learning Objective: 02-04-05 Explain how water has the ability to ionize into hydroxide ions (OH-) and into hydrogen ions (H+); and how the H+ concentration is expressed as a solutions pH.
Section: 2.4
Topic: The importance of water and its physical and chemical properties

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

TRUE

Blooms: Remember
Brooker - Chapter 02 #64
Difficulty: Easy
Learning Objective: 02-04-06 Give examples of how buffers maintain a stable environment in an animals body fluids.
Section: 2.4
Topic: The importance of water and its physical and chemical properties

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