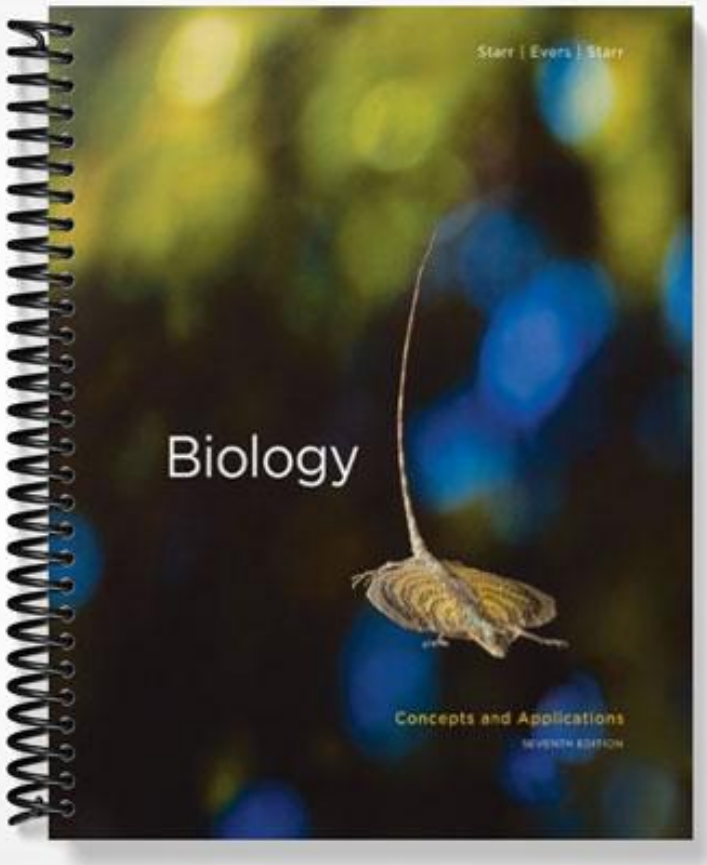
TEST BANK


Starr | Evers | Starr
Biology
Concepts and Applications
SEVENTH EDITION

CHAPTER 2--LIFE'S CHEMICAL BASIS

Student: _____

1. What is the smallest portion of a substance that retains the properties of an element?

   A. atom
   B. compound
   C. ion
   D. molecule
   E. mixture

2. The negative subatomic particle is the

   A. neutron
   B. proton
   C. electron
   D. neutron and proton
   E. proton and electron

3. The positive subatomic particle is the

   A. neutron
   B. proton
   C. electron
   D. neutron and proton
   E. proton and electron

4. The neutral subatomic particle is the

   A. neutron
   B. proton
   C. electron
   D. neutron and proton
   E. none of these

5. For an atom to be neutral, ____ must have the same number.

   A. electrons and neutrons
   B. electrons and protons
   C. neutrons and protons
   D. electrons, neutrons, and protons
   E. none of these

6. 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

7. The atomic number is determined by the number of

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

8. All atoms of an element have the same number of

   A. ions
   B. protons
   C. neutrons
   D. electrons
   E. protons and neutrons

9. The nucleus of an atom contains

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

10. The atomic weight (or mass) of an atom is determined by the weight of

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

11. An atom of sodium has an atomic number of 11 and a mass of 23. How many neutrons does it have?

    A. 11
    B. 12
    C. 23
    D. 34
    E. 35

12. If the atomic weight of hydrogen is 1, of carbon is 12, and of oxygen is 16, the molecular weight of glucose, $C_6H_{12}O_6$, expressed in grams is

    A. 24 grams
    B. 28 grams
    C. 52 grams
    D. 168 grams
    E. 180 grams

13. Isotopes of the same element differ in the number of

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

14. Radioactive isotopes

    A. are electrically unbalanced
    B. behave the same chemically, physically, and biologically as other isotopes
    C. have an excess number of electrons
    D. have an excess number of neutrons
    E. are produced when substances are exposed to radiation

15. When ^{14}C goes through radioactive decay, one of its neutrons splits into a proton and an electron. What does ^{14}C become?

    A. $^{13}C_6$
    B. $^{14}N_7$
    C. $^{13}N_7$
    D. $^{13}B_5$
    E. $^{12}B_5$

16. Which components of an atom are arranged in various energy levels or orbitals?

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

17. 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.

18. When a molecule is excited by light:

    A. It usually loses an electron.
    B. It usually gains an electron.
    C. An electron from an inner energy level may move to another level.
    D. An electron from an outer energy level may move to an inner level.
    E. An electron may be ejected from the nucleus of the atom.

19. Water is an example of a(n)

    A. atom
    B. ion
    C. compound
    D. mixture
    E. element

20. Which term includes the other four?

    A. atoms
    B. molecules
    C. electrons
    D. elements
    E. protons

21. Which substance is NOT an element?

    A. water
    B. oxygen
    C. carbon
    D. chlorine
    E. hydrogen

22. Which substance is NOT a compound?

    A. salt
    B. a carbohydrate
    C. carbon
    D. a nucleotide
    E. methane

23. A molecule is

    A. a combination of two or more atoms
    B. less stable than its constituent atoms separated
    C. electrically charged
    D. a carrier of one or more extra neutrons
    E. none of these

24. Magnesium has 12 protons. How many electrons are in its third energy level?

A. 2
B. 4
C. 6
D. 8
E. 10

25. Magnesium has 12 protons. How many electrons are in its first energy level?

A. 2
B. 4
C. 6
D. 8
E. 10

26. Magnesium has 12 protons. How many electrons are in its second energy level?

A. 2
B. 4
C. 6
D. 8
E. 10

27. Of the following, an atom with the atomic number ____ would be the least reactive.

A. 1
B. 3
C. 17
D. 18
E. 21

28. What is formed when an atom loses or gains an electron?

A. a new element
B. ion
C. molecule
D. bond
E. isotope

29. The bond in table salt (NaCl) is

A. polar
B. ionic
C. covalent
D. double
E. nonpolar

30. What type of bond is formed whenever atoms share a pair of electrons?

A. covalent
B. hydrogen
C. ionic
D. double
E. peptide

31. What type of bond is(are) usually strongest?

A. Hydrogen.
B. Ionic.
C. Covalent.
D. Hydrogen and covalent are equal.
E. Ionic and covalent are equal.

32. A chemical bond with unequal sharing is called

A. ionic
B. nonpolar
C. polar
D. all of these
E. none of these

33. What bonds usually hold large molecules in their 3-dimensional shape (tertiary structure)?

A. hydrogen
B. ionic
C. covalent
D. inert
E. single

34. A hydrogen bond is

A. a sharing of a pair of electrons between a hydrogen and an oxygen nucleus
B. a sharing of a pair of electrons between a hydrogen nucleus and either an oxygen or a nitrogen nucleus
C. an attractive force that usually involves a polarly-bonded hydrogen atom and another polarly-bonded atom with a partial negative charge
D. the loss of an electron by hydrogen to a highly electronegative atom
E. none of these

35. Which of the following is(are) classified as true chemical bonds?

A. hydrogen
B. ionic
C. covalent
D. both ionic and covalent
E. all of these

36. How do hydrophobic molecules react with water?

A. attracted to
B. absorbed by
C. repelled by
D. mixed with
E. polarized by

37. Water is important to living organisms because

A. Of its cohesive properties.
B. of its temperature stabilizing effect.
C. It is a liquid at room temperature.
D. It has the capacity to dissolve many substances.
E. All of these.

38. Glucose dissolves in water because it

A. ionizes
B. is a polysaccharide
C. is polar and forms many hydrogen bonds with the water molecules
D. has a very reactive primary structure
E. none of these

39. Why does ice float on water?

A. Ice is hydrophobic and repels water.
B. Water molecules have less mass the colder they get.
C. Water molecules are spaced farther apart in ice than in liquid water.
D. vibrating electrons in liquid water push ice to the surface.
E. None of these.

40. Which of the following is a naked proton?

A. hydrogen ion
B. acid
C. base
D. hydroxyl ion
E. acceptor

41. 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

42. 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

43. A salt will dissolve in water to form

    A. acids
    B. gases
    C. ions
    D. bases
    E. polar solvents

44. A reaction of an acid and a base will produce water and

    A. a buffer
    B. a salt
    C. gas
    D. solid precipitate
    E. solute

45. Of the following, pH ____ is the most acidic.

    A. 1
    B. 3
    C. 6
    D. 7
    E. 8

46. Cellular pH is kept near a value of seven, due to the action of

    A. salts
    B. buffers
    C. acids
    D. bases
    E. water

47. **Selecting the Exception**

    Four of the five answers listed below possess electrons in the third energy level. Select the exception.

    A. sodium (11)
    B. magnesium (12)
    C. chlorine (17)
    D. neon (10)
    E. argon (18)

48. **Selecting the Exception**

Four of the five answers listed below are alkaline (pH above seven). Select the exception.

A. milk of magnesia
B. household ammonia
C. Tums
D. phosphate detergent
E. black coffee

49. **Selecting the Exception**

Four of the five solutions listed below are acidic (pH below seven). Select the exception.

A. vinegar
B. cola
C. soap
D. lemon juice
E. beer

50. **Selecting the Exception**

Four of the five answers listed below are positively charged ions. Select the exception.

A. potassium ion (19)
B. hydrogen ion (1)
C. calcium ion (20)
D. magnesium ion (12)
E. chloride ion (17)

51. **Selecting the Exception**

Four of the five answers listed below are characteristics of water. Select the exception.

A. stabilizes temperature
B. common solvent
C. cohesion and surface tension
D. produces salts
E. less dense when solid

52. The various energy levels in an atom of chlorine (atomic number 17) have different numbers of electrons. Use the following numbers to answer the question(s).

1. Number of electrons in the second energy level	2	____
2. Number of electrons in the third energy level	8	____
3. Number of electrons in the first energy level	7	____

53. Why does carbon dioxide dissolved in water act as a buffer?

54. Explain why atoms such as helium, neon, and argon do not react with other atoms.

55. How do ectothermic (cold-blooded) animals make use of water's temperature-stabilizing effects?

CHAPTER 2--LIFE'S CHEMICAL BASIS Key

1. What is the smallest portion of a substance that retains the properties of an element?

A. atom
B. compound
C. ion
D. molecule
E. mixture

2. The negative subatomic particle is the

A. neutron
B. proton
C. electron
D. neutron and proton
E. proton and electron

3. The positive subatomic particle is the

A. neutron
B. proton
C. electron
D. neutron and proton
E. proton and electron

4. The neutral subatomic particle is the

A. neutron
B. proton
C. electron
D. neutron and proton
E. none of these

5. For an atom to be neutral, ____ must have the same number.

A. electrons and neutrons
B. electrons and protons
C. neutrons and protons
D. electrons, neutrons, and protons
E. none of these

6. 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

7. The atomic number is determined by the number of

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

8. All atoms of an element have the same number of

A. ions
B. protons
C. neutrons
D. electrons
E. protons and neutrons

9. The nucleus of an atom contains

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

10. The atomic weight (or mass) of an atom is determined by the weight of

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

11. An atom of sodium has an atomic number of 11 and a mass of 23. How many neutrons does it have?

A. 11
B. 12
C. 23
D. 34
E. 35

12. If the atomic weight of hydrogen is 1, of carbon is 12, and of oxygen is 16, the molecular weight of glucose, $C_6H_{12}O_6$, expressed in grams is

A. 24 grams
B. 28 grams
C. 52 grams
D. 168 grams
E. 180 grams

13. Isotopes of the same element differ in the number of

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

14. Radioactive isotopes

A. are electrically unbalanced
B. behave the same chemically, physically, and biologically as other isotopes
C. have an excess number of electrons
D. have an excess number of neutrons
E. are produced when substances are exposed to radiation

15. When ^{14}C goes through radioactive decay, one of its neutrons splits into a proton and an electron. What does ^{14}C become?

A. $^{13}C_6$
B. $^{14}N_7$
C. $^{13}N_7$
D. $^{13}B_5$
E. $^{12}B_5$

16. Which components of an atom are arranged in various energy levels or orbitals?

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

17. 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.

18. When a molecule is excited by light:

A. It usually loses an electron.
B. It usually gains an electron.
C. An electron from an inner energy level may move to another level.
D. An electron from an outer energy level may move to an inner level.
E. An electron may be ejected from the nucleus of the atom.

19. Water is an example of a(n)

A. atom
B. ion
C. compound
D. mixture
E. element

20. Which term includes the other four?

A. atoms
B. molecules
C. electrons
D. elements
E. protons

21. Which substance is NOT an element?

A. water
B. oxygen
C. carbon
D. chlorine
E. hydrogen

22. Which substance is NOT a compound?

A. salt
B. a carbohydrate
C. carbon
D. a nucleotide
E. methane

23. A molecule is

A. a combination of two or more atoms
B. less stable than its constituent atoms separated
C. electrically charged
D. a carrier of one or more extra neutrons
E. none of these

24. Magnesium has 12 protons. How many electrons are in its third energy level?

A. 2
B. 4
C. 6
D. 8
E. 10

25. Magnesium has 12 protons. How many electrons are in its first energy level?

A. 2
B. 4
C. 6
D. 8
E. 10

26. Magnesium has 12 protons. How many electrons are in its second energy level?

A. 2
B. 4
C. 6
D. 8
E. 10

27. Of the following, an atom with the atomic number ____ would be the least reactive.

A. 1
B. 3
C. 17
D. 18
E. 21

28. What is formed when an atom loses or gains an electron?

A. a new element
B. ion
C. molecule
D. bond
E. isotope

29. The bond in table salt (NaCl) is

A. polar
B. ionic
C. covalent
D. double
E. nonpolar

30. What type of bond is formed whenever atoms share a pair of electrons?

A. covalent
B. hydrogen
C. ionic
D. double
E. peptide

31. What type of bond is(are) usually strongest?

A. Hydrogen.
B. Ionic.
C. Covalent.
D. Hydrogen and covalent are equal.
E. Ionic and covalent are equal.

32. A chemical bond with unequal sharing is called

A. ionic
B. nonpolar
C. polar
D. all of these
E. none of these

33. What bonds usually hold large molecules in their 3-dimensional shape (tertiary structure)?

A. hydrogen
B. ionic
C. covalent
D. inert
E. single

34. A hydrogen bond is

A. a sharing of a pair of electrons between a hydrogen and an oxygen nucleus
B. a sharing of a pair of electrons between a hydrogen nucleus and either an oxygen or a nitrogen nucleus
C. an attractive force that usually involves a polarly-bonded hydrogen atom and another polarly-bonded atom with a partial negative charge
D. the loss of an electron by hydrogen to a highly electronegative atom
E. none of these

35. Which of the following is(are) classified as true chemical bonds?

A. hydrogen
B. ionic
C. covalent
D. both ionic and covalent
E. all of these

36. How do hydrophobic molecules react with water?

A. attracted to
B. absorbed by
C. repelled by
D. mixed with
E. polarized by

37. Water is important to living organisms because

A. Of its cohesive properties.
B. of its temperature stabilizing effect.
C. It is a liquid at room temperature.
D. It has the capacity to dissolve many substances.
E. All of these.

38. Glucose dissolves in water because it

A. ionizes
B. is a polysaccharide
C. is polar and forms many hydrogen bonds with the water molecules
D. has a very reactive primary structure
E. none of these

39. Why does ice float on water?

A. Ice is hydrophobic and repels water.
B. Water molecules have less mass the colder they get.
C. Water molecules are spaced farther apart in ice than in liquid water.
D. vibrating electrons in liquid water push ice to the surface.
E. None of these.

40. Which of the following is a naked proton?

A. hydrogen ion
B. acid
C. base
D. hydroxyl ion
E. acceptor

41. 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

42. 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

43. A salt will dissolve in water to form

A. acids
B. gases
C. ions
D. bases
E. polar solvents

44. A reaction of an acid and a base will produce water and

A. a buffer
B. a salt
C. gas
D. solid precipitate
E. solute

45. Of the following, pH ____ is the most acidic.

A. 1
B. 3
C. 6
D. 7
E. 8

46. Cellular pH is kept near a value of seven, due to the action of

A. salts
B. buffers
C. acids
D. bases
E. water

47. **Selecting the Exception**

Four of the five answers listed below possess electrons in the third energy level. Select the exception.

A. sodium (11)
B. magnesium (12)
C. chlorine (17)
D. neon (10)
E. argon (18)

48. **Selecting the Exception**

Four of the five answers listed below are alkaline (pH above seven). Select the exception.

A. milk of magnesia
B. household ammonia
C. Tums
D. phosphate detergent
E. black coffee

49. **Selecting the Exception**

Four of the five solutions listed below are acidic (pH below seven). Select the exception.

A. vinegar
B. cola
C. soap
D. lemon juice
E. beer

50. **Selecting the Exception**

Four of the five answers listed below are positively charged ions. Select the exception.

A. potassium ion (19)
B. hydrogen ion (1)
C. calcium ion (20)
D. magnesium ion (12)
E. chloride ion (17)

51. **Selecting the Exception**

Four of the five answers listed below are characteristics of water. Select the exception.

A. stabilizes temperature
B. common solvent
C. cohesion and surface tension
D. produces salts
E. less dense when solid

52. The various energy levels in an atom of chlorine (atomic number 17) have different numbers of electrons. Use the following numbers to answer the question(s).

1. Number of electrons in the second energy level	2	**3**
2. Number of electrons in the third energy level	8	**1**
3. Number of electrons in the first energy level	7	**2**

53. Why does carbon dioxide dissolved in water act as a buffer?

The equation below shows what happens when CO_2 dissolves in water:

$H_2O + CO_2 \neg\circledR H_2CO_3 \neg\circledR H^+ + HCO_3^-$

H^+ produced when carbonic acid neutralizes excess OH^-. If there is excess H^+, HCO_3^- absorbs it to form carbonic acid, and if excess carbonic acid forms, CO_2 bubbles out of solution.

54. Explain why atoms such as helium, neon, and argon do not react with other atoms.

In these atoms, the outermost energy level has no vacancies, thus they do not have to take, share, or lose electrons to fill any vacancies.

55. How do ectothermic (cold-blooded) animals make use of water's temperature-stabilizing effects?

These animals will bask in the sun to increase their temperature, as water in their bodies heats enough to perform their daily functions. Once they are warm enough, they can move about in either sun or shade, feeding, mating, etc. Their bodies will cool off slowly because water is a good heat sink. Since temperature changes of water are rather slow, they are also slow to overheat in the sun.