

TEST BANK



Concepts in
Biology

Thirteenth Edition

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Chapter 02

The Basics of Life: Chemistry

Multiple Choice Questions

1. An atom that has gained electrons is a
 - A. Reactant
 - B. Negative ion**
 - C. Positive ion
 - D. Compound ion

2. An atom with twelve electrons, twelve protons, and fourteen neutrons has a mass number of
 - A. Fourteen
 - B. Twenty-four
 - C. Thirty-eight
 - D. Twenty-six**

3. A hydroxide ion has an oxygen atom
 - A. Only
 - B. And an extra electron
 - C. And a hydrogen atom, and an extra electron**
 - D. And a hydrogen atom, and an extra proton

4. A negative charge is characteristic of a(n)
 - A. Positive ion
 - B. Electron**
 - C. Neutron
 - D. Proton

5. Solutions are always comprised of

- A.** Solvents and solute
- B. Liquids and solids
- C. Water and salts
- D. Compounds and ions

6. The greatest amount of kinetic energy is found in

- A.** Gases
- B. Liquids
- C. Solids
- D. Colloids

7. All chemical reactions

- A. Involve the creation of new atoms
- B.** Involve a change in chemical bonds
- C. Are dangerous
- D. Create energy

8. A covalent bond is

- A. The attraction that one atom has for another atom
- B.** The attraction between two atoms, formed by the sharing of electrons
- C. Formed between the positive charge of a hydrogen atom in one molecule and the negative charge of a nitrogen atom in another nearby molecule
- D. The attraction between a positive ion and a negative ion

9. Protons = 7, neutrons = 10, electrons = 7. The mass number of this atom is

- A. Seven
- B. Ten
- C. Fourteen
- D.** Seventeen

10. An acid is a substance that, in solution, releases

- A. Oxygen ions in H_2SO_4
- B.** Hydrogen ions, for example, HCl
- C. —COOR ions from beer
- D. Chloride ions from NaCl

11. A particle in the atom that has neither a negative nor a positive electrical charge is the

- A. Electron
- B. Element
- C. Isotope
- D.** Neutron

12. In the expression $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$, the products are

- A. $\text{C}_6\text{H}_{12}\text{O}_6$
- B. $\text{C}_6\text{H}_{12}\text{O}_6 + \text{zymase}$
- C. $\text{zymase} + 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$
- D.** $2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$

13. The correct symbol for a hydroxide ion is

- A. H^-
- B. H^+
- C.** $(\text{OH})^-$
- D. $(\text{OH})^+$

14. Kinetic energy is BEST defined as

- A. The energy of position
- B. The energy of electrical charge
- C.** The energy of motion
- D. Stored energy

15. Which one of the following statements is FALSE concerning matter?
- A. Matter is anything that has mass and takes up space
 - B. Air is matter
 - C.** All matter has the same density
 - D. The phases of matter are determined by the relative amounts of energy in the matter's molecules
16. When two atoms share a pair of electrons, this type of chemical bond is
- A. Ionic
 - B.** Covalent
 - C. Hydrogen
 - D. Negative-positive
17. Given that an unknown atom's mass number (AMU) is 27, its combination of particles could be
- A. 27 electrons, 16 neutrons, and 16 protons
 - B. 27 neutrons, 27 protons, and 27 electrons
 - C. 15 neutrons, 12 electrons, and 15 protons
 - D.** 16 electrons, 11 neutrons, and 16 protons
18. A base can be defined as
- A. A hydroxide ion acceptor
 - B. An attraction between a positive ion and a negative ion
 - C. A substance that gives up hydrogen ions when dissolved in water
 - D.** A substance that gives up hydroxide groups in a solution
19. The smallest particle of an element that still retains the properties of that element is a(n)
- A.** Atom
 - B. Proton
 - C. Electron
 - D. Element

20. A chemical reactant is one that

- A.** Enters into a chemical reaction
- B. Is the newly formed molecule
- C. Is at a point when both sides of the equation are equal
- D. During photosynthesis, is one molecule of sugar and six molecules of oxygen

21. An isotope is an atom of an element that varies in mass number due to variation in the number of

- A. Atoms
- B. Protons
- C.** Neutrons
- D. Electrons

22. A substance that is a solid

- A. Contains a large amount of oxygen
- B.** Contains molecules that are packed tightly together and vibrate in place
- C. Is bonded very tightly (covalent)
- D. Contains a large amount of hydrogen bonds

23. An atom that has lost electrons is a(n)

- A.** Cation ion
- B. Neutral atom
- C. Molecule
- D. Anion ion

24. If a particular atom has 27 electrons, 27 protons, and 31 neutrons, its mass number would be

- A. 52
- B. 54
- C. 56
- D.** 58

25. A solution that contains an excess of protons is(are)

A. Hydroxide ions

B. An acid

C. A base

D. The pH

26. $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$. The AgNO_3 in the equation is called a(n)

A. Reactant

B. Acid

C. Product

D. Base

27. An isotope shows which of the following?

A. A change in atomic number

B. Inability to form compounds

C. A change in mass number

D. More electrons

28. A material composed of atoms vibrating in place

A. Has high kinetic energy and is a gas

B. Has low kinetic energy and is a liquid

C. Has low kinetic energy and is a solid

D. Has high kinetic energy and is a solid

29. Which of the following is a chemical reaction that is also known as digestion?

A. Phosphorylation

B. Dehydration synthesis

C. Acid-base

D. Hydrolysis

30. Which kind of chemical reaction involves the attachment or removal of a phosphate group?

- A. Oxidation-reduction
- B. Acid phosphorylation
- C. Phosphorylation**
- D. Hydrolysis

31. Which of the following is an acid?

- A. K_2SO_4
- B. $NaNO_3$
- C. $CaCO_3$
- D. H_3PO_4**

32. An atomic particle with a weight of one, and a positive electrical charge is a(n)

- A. Electron
- B. Proton**
- C. Neutron
- D. Isotope

33. $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_2 + 6O_2$. In this reaction O_2 is

- A. A reactant
- B. A product**
- C. A reactant and a product
- D. Neither a reactant nor a product

34. One atom of sodium has a mass number of 22 units; another atom of sodium is 23 units. These two atoms are

- A. Nonreactive
- B. Unstable
- C. Ions
- D. Isotopes**

35. Which kind of attractive force holds two molecules together?

- A. Ionic bond
- B. Hydrogen bond**
- C. Covalent bond
- D. Sticky bond

36. A solution with a high concentration of hydrogen ions could have a pH of

- A. 2**
- B. 6
- C. 9
- D. 11

37. The attraction between a positively charged atom and a negatively charged atom within the same molecule is

- A. Ionic bonding**
- B. Hydrogen bonding
- C. Covalent bonding
- D. Ions

38. A scale used to indicate the strength of an acid or base is called a _____ scale.

- A. Thermodynamic
- B. Aquatic
- C. pH**
- D. Reduction

39. The part of an atom without a charge is a(n)

- A. Ion
- B. Neutron**
- C. Electron
- D. Molecule

40. Which of the following indicates "reactant"? $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + 6H_2O$

A. $C_6H_{12}O_6 + O_2$

B. H_2O

C. CO_2

D. None of the choices is correct

41. In the expression $2H_2S + 3O_2 \rightarrow 2H_2O + SO_2$, which is the acid?

A. H_2S

B. O_2

C. SO_2

D. H_2O

42. An ion having eleven protons, twelve neutrons, and ten electrons will have a charge of

A. +

B. -

C. ++

D. --

43. A list of all of the elements in order of increasing atomic number is called the

A. pH

B. Law of thermodynamics

C. Phase of matter

D. Periodic table

44. The mass of a given volume of matter is expressed as

A. Weight

B. Energy

C. Density

D. Gravity

45. The reaction $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + 6H_2O$ is which type of chemical reaction?

- A. Hydrolysis
- B. Transfer
- C. Dehydration synthesis
- D.** Oxidation-reduction

46. Which rule states that atoms attempt to acquire an outermost energy level with eight electrons through chemical reactions?

- A.** Octet
- B. Atomic stability
- C. Hybridization
- D. Full energy level

47. A person jogging displays what kind of energy?

- A. Potential
- B.** Kinetic
- C. Nuclear
- D. Sweat

48. $HCl + NaOH \rightarrow NaCl + H_2O$. This reaction is an example of a(n)

- A. Oxidation/reduction reaction
- B. Hydrolysis reaction
- C. Phosphorylation reaction
- D.** Acid-base reaction

49. The atomic number for carbon is 6. The isotope ^{14}C has ____ neutrons.

- A. 6
- B.** 8
- C. 14
- D. 20

50. Given that an unknown atom's mass is 11, its combination of subatomic particles could be
- A. 11 protons, 11 neutrons, and 11 electrons
 - B. 6 protons, 5 neutrons, and 11 electrons
 - C. 4 protons, 3 neutrons, and 4 electrons
 - D.** 5 protons, 6 neutrons, and 5 electrons

51. One molecule of sodium nitrate (NaNO_3) contains ____ atoms.
- A. 6
 - B.** 5
 - C. 4
 - D. 3

52. The statement that energy is never created or destroyed is known as
- A. Thermodynamics
 - B. Kinetic molecular theory
 - C. First law of matter and energy
 - D.** Law of conservation of energy

53. Which one of the following rows BEST represents a gas in relation to a solid or liquid of the same compound?

	Attraction between Molecules	Kinetic Energy	Distance between Molecules
1	strong	high	great
2	weak	low	slight
3	strong	low	slight
4	weak	high	great

- A. Row 1
- B. Row 2
- C. Row 3
- D.** Row 4

54. Which one of the following is TRUE with regard to the numbers of subatomic particles in an atom?

- A. The number of neutrons always equals the number of protons
- B. The number of electrons always equals the number of neutrons
- C. The atomic number always equals the number of protons**
- D. The atomic number always equals the number of neutrons

55. The fact that all matter is made up of tiny particles that are in constant motion is known as the

- A. First law of thermodynamics
- B. Energy motion theory
- C. Kinetic molecular theory**
- D. First law of solids

56. The formulation $\text{Ca}^{++}\text{Cl}_2$, indicates

- A. Covalent bonding between one calcium atom and two chlorine atoms
- B. One calcium ion that has gained two electrons and formed ionic bonds with two chloride ions that have each lost one electron
- C. One calcium atom with two protons and two chlorine atoms that share one electron
- D. One calcium ion that has lost two electrons and formed ionic bonds with two chloride ions that have each gained one electron**

57. One atomic mass unit (AMU) approximately equals the mass of one

- A. Proton**
- B. Electron
- C. Nucleus
- D. Proton plus the mass of one neutron

58. A bond in which the positive end of one polar molecule is attracted to the negative end of another polar molecule is a(n)

- A. Covalent bond
- B. Ionic bond
- C. Electron bond
- D. Hydrogen bond**

59. When a pencil falls from a tabletop to the floor

- A. Kinetic energy is converted to potential energy
- B. Potential energy is converted to kinetic energy**
- C. Energy is created
- D. Energy is destroyed

60. The pH of a strong base is closest to

- A. 2
- B. 6
- C. 9
- D. 12**

61. A neutral atom with an atomic number of 15 will have _____ electrons in its outermost energy level.

- A. 3
- B. 5**
- C. 8
- D. 15

62. Which one of the following represents the correct mass, location, and charge of a proton?

	Attraction between Molecules	Kinetic Energy	Distance between Molecules
1	strong	high	great
2	weak	low	slight
3	strong	low	slight
4	weak	high	great

- A. Row 1**
- B. Row 2
- C. Row 3
- D. Row 4

63. The higher the pH,

- A. The greater the hydroxide ion concentration
- B. The more acidic the solution
- C. The greater the hydrogen ion concentration
- D. The lower the pH number

64. A difference between an acid and a base is that

- A. Acids are harmful and bases are not
- B. Acids release hydroxide ions and bases release hydrogen ions
- C. Acids have a high pH value and bases have a low pH value
- D. Acids have a low pH value and bases have a high pH value

65. A magnesium ion contains twelve protons and ten electrons. A chloride ion contains seventeen protons and eighteen electrons. Given this information, the chemical formula for magnesium chloride is

- A. MgCl
- B. Mg₂Cl
- C. MgCl₂
- D. Mg₂Cl₂

66. Which reaction below produces a salt?

- A. $\text{KOH} + \text{H}_2\text{O} \rightarrow \text{K}^+ + \text{OH}^- + \text{H}_2\text{O}$
- B. $\text{HC}_2\text{H}_3\text{O}_2 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_3\text{O}_2^- + \text{H}^+ + \text{H}_2\text{O}$
- C. $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- D. $\text{C}_6\text{H}_{12}\text{O}_6 + \text{C}_6\text{H}_{12}\text{O}_6 \rightarrow \text{C}_{12}\text{H}_{22}\text{O}_{11} + \text{H}_2\text{O}$

67. Fluorine has the atomic number 9. The correct notation for a fluoride ion is

- A. F⁻
- B. F⁻
- C. F⁺
- D. F⁺⁺

68. The energy level listed below with the most energetic electrons is

A. 1

B. 2

C. 3

D. None of these. All energy levels contain electrons of equal energy

69. An atom that contains 8 electrons in its outermost energy level is said to be

A. Inert

B. Reactive

C. A cation

D. A molecule

70. Which of the following is monatomic?

A. He

B. H₂

C. O₂

D. N₂

Essay Questions

71. List and define two types of chemical bonds.

COVALENT -- attractive force between two atoms that share electrons

IONIC -- attractive force between ions of opposite charge

HYDROGEN -- attractive force between polar molecules

Multiple Choice Questions

72. In which one of the following situations do the molecules have the greatest amount of energy?

- A. Ice in a Coke
- B. Cold tap water
- C. Water vapor**
- D. Water condensed on your windshield

73. If an atom has the atomic number 4 and the atomic mass 9.012 it will

- A. Have 5 electrons
- B. Have 5 neutrons**
- C. Have 9 electrons
- D. Weigh 13.012 atomic mass units

74. A measure of the average kinetic energy of the molecules making up a substance is known as

- A. Temperature**
- B. Heat
- C. Potential
- D. Phase of matter

75. Which of the following would have the smallest number of hydrogen ions (H^+)?

- A. A solution with the pH 2
- B. A solution with the pH 6
- C. A container of acetic acid (vinegar)
- D. A container of a strong base**

76. In which one of the following situations do the molecules have the greatest attraction for one another?

- A. An ice cube**
- B. Cold tap water
- C. Water vapor
- D. Water condensed on your windshield

77. If an atom has the atomic number 4 and the atomic mass 9.012 it will have _____ electrons in the first energy level.

- A. 1
- B. 2
- C. 3
- D. 4

78. If an atom has the atomic number 11 and the atomic mass 22.99, it will have

- A. 1 electron in the third energy level
- B. 1 electron in the second energy level
- C. 3 electrons in the fourth energy level
- D. 1 electron in the first energy level

79. Which of the following would have the largest number of hydrogen ions (H^+)?

- A. A solution with the pH 11
- B. A solution with the pH 8
- C. A container of acetic acid (vinegar)
- D. A container of a strong base

80. Which combination of elements is most likely to undergo a chemical reaction based on their positions in the Periodic Table of the Elements?

- A. Na and Cl
- B. Na and Mg
- C. F and Ne
- D. All would react

81. The lower the _____, the slower the molecules are moving.

- A. Density
- B. Temperature
- C. Potential energy
- D. Gravity

82. The fact that the atomic weight of carbon is 12.0112 probably indicates that carbon atoms vary in the number of _____ they contain.

- A. Electrons
- B. Protons
- C. Neutrons**
- D. Nuclei

83. Human blood has a pH of about 7.4. If the pH should change to 7.0, this would indicate

- A. A decrease in pH
- B. An increase in acidity
- C. A change in electrolytes
- D. All the choices are correct**

84. When you sprinkle table salt on your food, the salt

- A. Ionizes
- B. Dissociates**
- C. Forms covalent bonds with the food
- D. Undergoes an acid-base reaction

85. The type of chemical bond that holds OH^- and H^+ together is

- A. Ionic**
- B. Covalent
- C. Hydrogen
- D. All the choices are correct

86. Which of the following is a base or alkaline material?

- A. NaOH**
- B. HCl
- C. H_2SO_4
- D. NaCl

87. Which of the following is an acid?

- A. NaOH
- B. HOH
- C. H₂SO₄**
- D. NaCl

88. Which of the following is a salt?

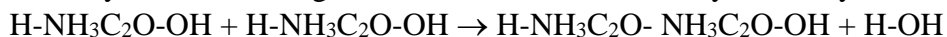
- A. NaOH
- B. HOH
- C. H₂SO₄
- D. MgCl₂**

89. What is happening here?



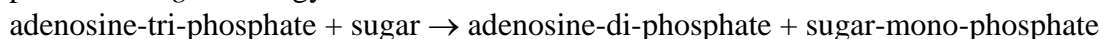
- A. A solution of ions is prepared
- B. The dissociation of ions
- C. Movement of an electron from the outermost energy level of Na to the outermost energy level of Cl
- D. All the choices are true**

90. Why is the following reaction considered to be dehydration synthesis?



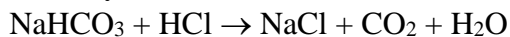
- A. Water molecules are hidden in the products H-NH₃C₂O-NH₃C₂O-OH
- B. This is the same reaction that occurs during digestion and water is required
- C. Water molecules are formed as a result of the breakdown of H-NH₃C₂O-NH₃C₂O-OH
- D. Water molecules are formed as a new, more complex end product is formed**

91. Comparing reactants to end products in the following chemical reaction, which end product will *gain* energy?



- A. Sugar-mono-phosphate**
- B. Adenosine-di-phosphate
- C. Adenosine-tri-phosphate
- D. None of these choices is correct

92. Why is NaHCO_3 considered a base in the following reaction?



- A. It contains hydrogen ions
- B.** It is a hydrogen ion acceptor
- C. It donates hydroxide ions in this reaction
- D. It results in the formation of CO_2

93. When electrons in a covalent bond are not equally shared, the molecule is said to be

- A.** Polar
- B. Nonpolar
- C. Lopsided
- D. Unable to form hydrogen bonds

94. Because this is happening $\text{Water} + \text{NaCl} \rightarrow \text{Na}^+ + \text{Cl}^-$ the solution formed is called

- A. Ionic
- B. An electrolyte
- C. Salty
- D.** All of the choices are true

95. These are mixtures of weak acids and the salts of weak acids that tend to maintain constant pH.

- A.** Buffers
- B. Oxidants
- C. Electrolytes
- D. Soft drinks

96. When electrons in a covalent bond are shared equally, the molecule is said to be

- A. Polar
- B.** Nonpolar
- C. Lopsided
- D. Unable to form hydrogen bonds