Name: _____ Class: _____ Date: _____

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1. When can we say that atom has no vacancy, or the atom is full?
   a. An atom's outer shell is filled with electrons
   b. An atom's inner shell is filled with electrons
   c. An atom's outer shell is filled with neutrons
   d. An atom's outer shell is filled with protons
   e. An atom's inner shell is filled with protons

ANSWER: a

2. How does the energy of an electron relate with the distance from the nucleus?
   a. The closer an electron is from the nucleus, the greater its energy.
   b. The farther an electron is from the nucleus, the greater its energy.
   c. The farther a proton is from the nucleus, the greater the electron's energy.
   d. The closer a proton is from the nucleus, the greater the electron's energy.
   e. The closer a neutron is from the nucleus, the greater the electron's energy.

ANSWER: b

3. What is the smallest unit of an element that retains the properties of that element?
   a. Atom
   b. Compound
   c. Orbital
   d. Molecule
   e. Mixture

ANSWER: a

4. Which substance is *not* an element?
   a. Chlorine
   b. Oxygen
   c. Carbon
   d. Water
   e. Hydrogen

ANSWER: d

5. The atomic number of an atom refers to its ____.
   a. mass or weight
   b. number of protons
   c. number of protons and neutrons
   d. number of neutrons
   e. number of electrons

ANSWER: b

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6. Isotopes of atoms ____.
   a. have the same number of neutrons but a different number of protons
   b. behave the same chemically and biologically from other isotopes
   c. are the same physically and biologically but differ from other isotopes chemically
   d. have the same number of protons but a different number of electrons
   e. are produced when atoms lose electrons

ANSWER: b

7. An atom can get rid of vacancies by participating in a _____.
   a. cell bond
   b. physical bond
   c. chemical bond
   d. magnetic bond
   e. electric bond

ANSWER: c

8. The nucleus of an atom contains ____.
   a. neutrons and protons
   b. neutrons and electrons
   c. protons and electrons
   d. protons only
   e. neutrons only

ANSWER: a

9. The ____ of an atom have a negative charge.
   a. nuclei
   b. protons
   c. neutrons
   d. ions
   e. electrons

ANSWER: e

10. The ____ of an atom have no charge.
   a. electrons
   b. protons
   c. neutrons
   d. ions
   e. nuclei

ANSWER: c

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11. The mass number 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

ANSWER: a

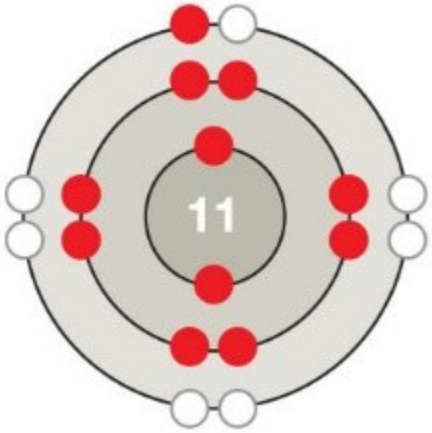

Figure 2.5 C

12. Which of the following is depicted in the accompanying figure?

a. Hydrogen atom
b. Sodium atom
c. Helium ion
d. Chlorine ion
e. Oxygen molecule

ANSWER: b

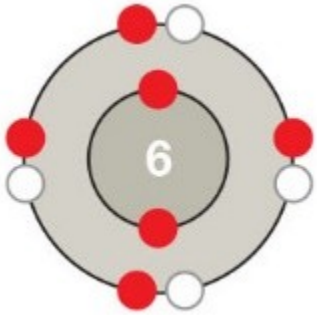

Figure 2.5B

13. Which atom is depicted in the accompanying figure?

a. Hydrogen
b. Helium

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c. Carbon
d. Nitrogen
e. Oxygen

ANSWER: c

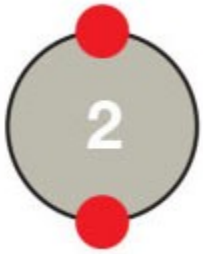

Figure 2.5A

14. Based on its outer shell, the atom in the accompanying figure would be characterized as ____.
a. very stable
b. somewhat stable
c. somewhat unstable
d. very unstable
e. radioactive

ANSWER: a

15. All isotopes of an element have a different number of ____.
a. electrons
b. protons
c. neutrons
d. orbital shells
e. atoms

ANSWER: c

16. In the chemical shorthand, ^{14}C, the 14 represents the number of ____.
a. excess neutrons
b. protons plus neutrons
c. electrons
d. protons plus electrons
e. radioactive particles

ANSWER: b

17. Isotopes of an element are differentiated by their ____.
a. atomic weight
b. number of orbital shells

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c. element name
d. mass number
e. electron profile

ANSWER: d

18. A(n) _____ is a strong mutual attraction between ions of opposite charge.
a. ionic bond
b. molecular bond
c. covalent bond
d. polar covalent bond
e. magnetic bond

ANSWER: a

19. Tracers are elements that ____.
a. are used in minute amounts in plants
b. can be monitored during biochemical reactions
c. must be inert
d. have an unbalanced electrical charge
e. must have a stable nucleus

ANSWER: b

20. The radioisotope ^{14}C can be used as a research tracer because it ____.
a. decays to ^{12}C
b. has a different number of protons than ^{12}C
c. has fewer neutrons than ^{12}C
d. behaves the same chemically as ^{12}C
e. has six carbons and six neutrons

ANSWER: d

21. The slight positive charge of a hydrogen atom in one water molecule is drawn to the slight negative charge of an oxygen atom in another. This interaction is known as a(n) _____.
a. oxygen bond
b. water bond
c. hydrogen bond
d. covalent polarity bond
e. magnetic bond

ANSWER: c

22. Which bond can break most easily?

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a. Ionic bond
b. Covalent bonds
c. Polar covalent bond
d. Hydrogen bond
e. Magnetic bond

ANSWER: d

23. Atoms with a(n) ____ are more likely to form chemical bonds.
a. filled outer orbital shell
b. unfilled outer orbital shell
c. filled inner orbital shell
d. unfilled inner orbital shell
e. large number of orbital shells

ANSWER: b

24. Atoms can form ____ in order to achieve a full outer orbital shell.
a. ions
b. covalent bonds
c. H bonds
d. ions and covalent bonds
e. ions and H bonds

ANSWER: b

25. Nitrogen, with an atomic number of 7, has ____ electron(s) in the first energy level and ____ electrons in the second energy level.
a. one; six
b. two; five
c. three; four
d. four; three
e. five; two

ANSWER: b

26. What is a buffer?
a. A substance that releases hydrogen ions in water
b. A substance that accepts hydrogen ions in water
c. A substance that accepts oxygen ions in water
d. A set of chemicals that keep the pH of a solution stable
e. A substance that releases oxygen ions in water

ANSWER: d

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27. Which statement is *false*?
    a. A molecule must be made of at least two atoms.
    b. Compounds are made of elements.
    c. Two atoms of oxygen make a molecule of oxygen.
    d. Chemical bonds form between molecules of solute and solvent.
    e. Elements are found in compounds and molecules.

ANSWER: d

28. A molecule consists of ____.
    a. radioactive compounds
    b. two or more atoms of the same element
    c. electrically charged elements
    d. elements with one or more extra neutrons
    e. atoms held together by chemical bonds

ANSWER: e

29. The bond in table salt (NaCl) is ____.
    a. polar
    b. ionic
    c. covalent
    d. double
    e. nonpolar

ANSWER: b

30. In ____ bonds, both atoms exert the same pull on shared electrons.
    a. triple covalent
    b. polar covalent
    c. double covalent
    d. nonpolar covalent
    e. coordinate covalent

ANSWER: d

31. In covalent bonds, ____.
    a. atoms share electrons
    b. atoms give up electrons
    c. atoms accept electrons
    d. electrons cannot be shared equally
    e. electrons are always shared equally

ANSWER: a

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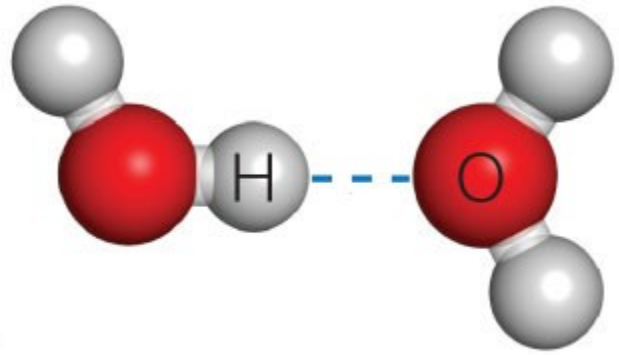

Figure 2.11B

32. The dashed line in the accompanying figure represents a(n) ____.
    a. covalent bond
    b. ionic bond
    c. hydrogen bond
    d. polar covalent bond
    e. hydrophobic interaction

ANSWER: c

33. A hydrogen bond is an attraction between a(n) ____ hydrogen atom and another atom taking part in ____.
    a. covalently bonded; the same polar covalent bond
    b. ionically bonded; the same polar covalent bond
    c. covalently bonded; a separate polar covalent bond
    d. ionically bonded; a separate nonpolar covalent bond
    e. nonpolar covalently bonded; a separate nonpolar covalent bond

ANSWER: c

34. Water is important to the interactions of biological molecules because it ____.
    a. is a good buffer
    b. destabilizes temperature
    c. is a poor solvent for polar and ionic substances
    d. has weak cohesive properties
    e. promotes hydrophilic interactions

ANSWER: e

35. 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. an extremely unstable molecule

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e. highly nonpolar

ANSWER: c

36. The solvent, cohesive, and temperature stabilization properties of water are primarily due to its ____.

a. ability to promote hydrophilic interactions
b. ionic bonds
c. hydrogen bonds
d. ability to promote hydrophobic interactions
e. nonpolar nature

ANSWER: c

37. The column of water extending in tubes from plant roots to leaves is maintained by ____.

a. hydrophilic interactions
b. ionic bonds
c. covalent bonds
d. hydrophobic interactions
e. cohesion between water molecules

ANSWER: e

38. When exposed to water, sodium chloride (NaCl) ____.

a. dissolves into Na^+ and Cl^- ions
b. crystallizes into a solid
c. dissolves into Na^- and Cl^+ ions
d. crystallizes into a liquid
e. forms a hydrophobic compound

ANSWER: a

39. A salt will dissolve in water to form ____.

a. acids
b. only hydrogen and oxygen bonds
c. ions other than H^+ and OH^-
d. bases
e. buffers

ANSWER: c

40. "Acidic" is an appropriate description for four of the following. Which one is the exception?

a. Excess hydrogen ions
b. The contents of the stomach
c. Magnesium hydroxide

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d. HCl
e. A pH less than 7

ANSWER: c

41. A solution with a pH of 9 has ____ times fewer hydrogen ions than a solution with a pH of 6.
a. two
b. four
c. 10
d. 100
e. 1,000

ANSWER: e

42. Blood pH is kept near a value of 7.3–7.5 because of ____.
a. salts
b. buffers
c. acids
d. bases
e. water

ANSWER: b

43. Tracers allow scientists to track a molecule through a biochemical process by replacing an atom in that molecule with its _____.
ANSWER: radioisotope

44. The sharing of two pairs of electrons between two atoms is called a(n) _____.
ANSWER: double bond

45. ^{14}C is a radioactive isotope, and it turns into _____ when it decays.
ANSWER: nitrogen

46. The predictable rate of _____ allows scientists to estimate the age of a rock or fossil by examining its isotope content.
ANSWER: decay
radioactive decay

47. The ability of a solution to resist changes in pH depends on its _____ capacity.
ANSWER: buffering

Classification. The various energy levels in an atom of magnesium (^{24}Mg) have different numbers of electrons. Use the numbers below to answer the following questions.
a. 1
b. 2

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c. 3
d. 6
e. 8

48. The number of electrons in the first energy level
ANSWER: b

49. The number of electrons in the third energy level
ANSWER: b

50. The number of electrons in the second energy level
ANSWER: e

Classification. The following are types of chemical bonds. Answer the questions below by matching the descriptions with the most appropriate bond type.

a. hydrogen
b. ionic
c. covalent
d. polar covalent
e. double bond

51. The bond between the atoms of table salt (NaCl)
ANSWER: b

52. The bond type holding several molecules of water together
ANSWER: a

53. The bond between the oxygen atoms of oxygen gas (O_2)
ANSWER: e

54. The bond that breaks when salts dissolve in water
ANSWER: b

55. A bond in which connected atoms share electrons
ANSWER: c

56. A bond in which connected atoms unequally share electrons
ANSWER: d

Classification. The following are important terms relating to water's special properties. Answer the questions below by matching the descriptions with the most appropriate word.

a. hydrophobic
b. hydrophilic

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c. salt
d. solute
e. solvent

57. NaCl becomes this in solution
ANSWER: d

58. Property of NaCl that enables it to dissolve in water
ANSWER: b

59. A liquid that dissolves other substances
ANSWER: e

60. A compound that releases ions when dissolved in water
ANSWER: c

61. Property of nonpolar compounds
ANSWER: a

Classification. The following are important terms relating to acids and bases. Answer the questions below by matching the descriptions with the most appropriate word.

a. pH
b. acid
c. base
d. buffer

62. Substance that accepts, but does not release, H^+
ANSWER: c

63. Lemon juice
ANSWER: b

64. Substance that releases, but does not accept, H^+
ANSWER: b

65. Set of chemicals that stabilize pH
ANSWER: d

66. Measure of H^+ in a fluid
ANSWER: a

67. Toothpaste

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ANSWER: c