Study Guide – Chapter 1 and 2
Interactions of Matter

Chapter 1 Section 1- Pages 4-7: Electrons and Chemical Bonding

COMBINING ATOMS THROUGH CHEMICAL BONDING

Circle the letter of the best answer for each question.

1. Which of these substances is a combination of carbon, hydrogen, and oxygen?
   a. sugar c. water
   b. salt d. sulfuric acid

2. What is the joining of atoms to form new substances?
   a. chemical bonding
   b. bonding
   c. joining chemicals
   d. bonding atoms

3. What do you call an interaction that holds two atoms together?
   a. chemical hold
   b. chemical bond
   c. chemical connection
   d. bond of chemicals

4. What can be shared in chemical bonds?
   a. atoms c. electrons
   b. protons d. neutrons

5. What do we use to help us know why atoms form bonds?
   a. observations c. charts
   b. maps d. models
ELECTRON NUMBER AND ORGANIZATION

6. How many valence electrons are in an oxygen atom?
   a. 2  
   b. 4  
   c. 6  
   d. 8

Outer-Level Electrons and Bonding

Read the words in the box. Read the sentences. Fill in each blank with the word or phrase that best completes the sentence. valence electron atomic number group

valence electron     atomic number     group

7. The number of protons in an atom is

8. On the periodic table, atoms in the same
   ___________________________ have the same number of valence electrons.

9. An electron in the outermost level of an atom is a(n)
   ___________________________

TO BOND OR NOT TO BOND

Circle the letter of the best answer for each question.

10. What determines whether an atom will form bonds?
    a. number of electrons
    b. number of valence electrons
    c. number of protons
    d. number of neutrons
11. Which group on the periodic table contains elements that do not normally form chemical bonds?
   a. Group 2
   b. Group 6
   c. Group 10
   d. Group 18

Read the words in the box. Read the sentences. Fill in each blank with the word or phrase that best completes the sentence.

Read the words in the box. Read the sentences. Fill in each blank with the word or phrase that best completes the sentence.

<table>
<thead>
<tr>
<th>eight</th>
<th>two</th>
<th>electrons</th>
</tr>
</thead>
</table>

12. Helium atoms need only __________________________ valence electrons to have a filled outer energy level.

13. Atoms bond by gaining, losing, or sharing __________________________

14. Atoms of the noble gases have __________________________ valence electrons and usually do not form chemical bonds.

| eight | two | magnesium | helium |
|-------|-----|-----------|

Filling the Outermost Level

15. Atoms of __________________________ form bonds by losing 2 electrons in their outermost energy level.

16. A filled outermost level in most atoms has __________________________ electrons.
Is Two Electrons a Full Set?

17. The first level of an atom has ____________________________ electrons.

18. The outermost energy level in a(n) ____________________________ atom is the first energy level.

Chapter 1 Section 2 – Pages 8-11: Ionic Bonds
FORMING IONIC BONDS

Circle the letter of the best answer for each question.

19. What do you call a bond that forms when electrons are transferred from one atom to another?
   a. compound bond
   b. ionic bond
   c. crystal bond
   d. atomic bond

Charged Particles

20. What are charged particles that form when atoms gain or lose electrons?
   a. ions
   b. atomic ions
   c. bonds
   d. particle atoms

21. Why are ions charged particles?
   a. because the number of electrons changes
   b. because the number of protons changes
   c. because the number of neutrons changes
   d. because the number of atoms changes
FORMING POSITIVE IONS

22. What charge does a sodium ion have?
   a. 1−
   b. 1+
   c. 2−
   d. 2−

23. What is the chemical symbol for a sodium ion?
   a. S^+
   b. S^−
   c. Na^+
   d. Na^−

Read the words in the box. Read the sentences. Fill in each blank with the word or phrase that best completes the sentence.

- positive ions
- valence electrons
- ion
- energy
- negative ions

24. If a sodium atom loses its only valence electron, it becomes a(n)

25. For electrons to pull away from atoms,

26. When atoms lose electrons in an ionic bond, they become

27. Most metals have few ________________________ and form positive ions.

28. The energy needed to take electrons from metals comes from the formation of ________________________.
FORMING NEGATIVE IONS

Circle the letter of the best answer for each question.

29. When atoms gain electrons during chemical changes, what charge do they have?
   a. positive charge  b. negative charge  c. neutral charge  d. electric charge

30. The symbol for oxide is $O^{2-}$. How many electrons did the oxygen atom gain?
   a. 0  b. 1  c. 2  d. 3

Nonmetal Atoms Gain Electrons

31. What ending is used for the names of negative ions?
   a. -ion  b. -ade  c. -ide  d. -ite

The Energy of Gaining Electrons

32. What do atoms of group 17 elements give off when they gain electrons?
   a. energy  b. protons  c. bonds  d. charges

IONIC COMPOUNDS

33. What is the regular pattern that forms when ions bond?
   a. compound  b. chemical compound  c. crystal lattice  d. ionic bond

34. Which of the following is a property of a crystal lattice?
   a. low melting point  b. high melting point  c. low boiling point  d. malleability
COVALENT BONDS

Circle the letter of the best answer for each question.

35. Sugar and water are held together by which type of bond?
   a. metallic
   b. covalent
   c. ionic
   d. atomic

36. Which is a property of a substance formed with a covalent bond?
   a. low melting point
   b. high melting point
   c. low boiling point
   d. high boiling point

Covalent Bonds and Molecules

Read the description. Then, draw a line from the dot next to each description to the matching word.

37. formed when atoms share one or more electrons

   a. molecule

38. consists of two or more atoms joined together

   b. covalent bond

39. used to show the valence electrons in an atom

   c. electron-dot diagram
COVALENT COMPOUNDS AND MOLECULES

Circle the letter of the best answer for each question.

40. What is a molecule made up of two atoms of the same element?
   a. diatomic element
   b. diatomic molecule
   c. molecular element
   d. covalent molecule

41. What is an element found in nature as diatomic molecules?
   a. diatomic element
   b. diatomic molecule
   c. molecular element
   d. covalent molecule

Circle the letter of the best answer for each question.

42. Oxygen and nitrogen are examples of which of the following?
   a. diatomic element
   b. diatomic molecule
   c. molecular element
   d. covalent molecule

43. What do dots around an electron-dot diagram stand for?
   a. valence electrons
   b. molecules
   c. atoms
   d. neutrons
The Simplest Molecules

Read the words in the box. Read the sentences. Fill in each blank with the word or phrase that best completes the sentence.

- diatomic, complex
- carbon, four

44. The simplest molecules are ______________________________ molecules.
45. Carbon atoms make ______________________ covalent bonds to fill their energy level.
46. Soap and proteins are examples of ______________________ molecules.
47. The basis of many complex molecules are ______________________ atoms.

METALLIC BONDS

Read the words in the box. Read the sentences. Fill in each blank with the word that best completes the sentence.

- electrons, metallic bond, overlap

48. Bonding in metals occurs because the outer energy levels of the atoms ________________.
49. A bond that forms when charged metal ions attract electrons in a metal is a(n) ________________.
50. Positively charged metal ions form when metal atoms lose ________________.

PROPERTIES OF METALS

Circle the letter of the best answer for each question.

51. Which of the following properties is NOT due to metallic bonds?
   a. electrical conductivity
   b. ductility
   c. solubility
   d. malleability
Read the description. Then, draw a line from the dot next to each description to the matching word.

52. the ability of metal to be drawn into wires  ●
   a. moving electrons
53. the ability of metal to be hammered into sheets  ●
   b. malleability
54. this allows metals to be bent, but not broken  ●
   c. ductility
55. the ability to conduct electric current  ●
   d. conductivity

Chapter 2 Section 1 Pages 28-31: Forming New Substances

CHEMICAL REACTIONS

Circle the letter of the best answer for each question.

56. Which of the following describes chlorophyll breaking down into new substances?
   a. chemical substance
   b. chemical reaction
   c. chemical mixture
   d. chemical solution

57. What is true of the new materials formed in a chemical reaction?
   a. Properties differ from original materials.
   b. Properties are the same as original materials.
   c. All substances have original properties.
   d. No substances have original properties.
**Signs of Chemical Reactions**

Read the words in the box. Read the sentences. **Fill in each blank** with the word or phrase that best completes the sentence.

precipitate  chemical reaction

58. When a substance changes to make a new substance, a __________________ occurs.

59. A solid that is formed in a solution is called a __________________.

**Circle the letter of the best answer for each question.**

60. Which of the following is a sign of a chemical reaction?
   a. thermal energy from a fire
   b. ice melting on the ground
   c. steam from a teapot
   d. water freezing on a pond

**A Change of Properties**

61. How can you be sure a chemical reaction is happening?
   a. a solid dissolves
   b. a new solid is formed
   c. water turns to steam
   d. a mixture is made
BONDS: HOLDING MOLECULES TOGETHER

Read the words in the box. Read the sentences. Fill in the blank with the word or phrase that best completes the sentence.

<table>
<thead>
<tr>
<th>diatomic</th>
<th>substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>chemical bond</td>
<td>molecules</td>
</tr>
</tbody>
</table>

62. The force that holds two atoms together is called a ________________.

63. When ________________ bump into one another with enough energy, chemical bonds break.

64. When chemical bonds break, the atoms rearrange to form new ________________.

65. A molecule made up of two atoms is ________________.

Chapter 2 Section 2 – Pages 32-37: Chemical Formulas and Equations

Circle the letter of the best answer for each question.

66. What can be put together to make chemical formulas?
   a. letters of the alphabet
   b. chemical sentences
   c. chemical symbols
   d. chemical reactions

CHEMICAL FORMULAS

67. About how many elements form all substances?
   a. 10
   b. 100
   c. 200
   d. 1,000
68. What does a chemical formula use to represent a substance?
   a. chemical sentences
   b. chemical symbols and numbers
   c. the chemical alphabet
   d. chemical reactions and molecules

69. What is the number 2 called in the formula H₂O?
   a. superscript
   b. element
   c. symbol
   d. subscript

**Writing Formulas for Covalent Compounds**

**Circle the letter of the best answer for each question.**

70. Which of the following is the chemical formula for carbon dioxide?
   a. C₂O
   b. CO₂
   c. 2CO
   d. CO

71. What does a prefix in a chemical’s name tell you?
   a. number of atoms
   b. number of chemicals
   c. number of molecules
   d. number of elements

**Writing Formulas for Ionic Compounds**

72. What makes up an ionic compound?
   a. two chemicals
   b. two nonmetals
   c. a metal and a nonmetal
   d. two charged metals
73. What is the total charge in an ionic compound?
   a. 2
   b. 1
   c. 0
   d. –1

**CHEMICAL EQUATIONS**

**Describing Reactions by Using Equations**

Read the words in the box. Read the sentences. Fill in each blank with the word or phrase that best completes the sentence.

<table>
<thead>
<tr>
<th>product</th>
<th>reactant</th>
<th>chemical equation</th>
</tr>
</thead>
</table>

74. A shorthand way of describing a chemical reaction using chemical symbols and numbers is called a ______________________.

**From Reactants to Products**

75. A substance or molecule that participates in a chemical reaction is called a ______________________.

76. The substance that forms in a chemical reaction is called a ______________________.

**THE IMPORTANCE OF ACCURACY**

**Circle the letter** of the best answer for each question.

77. How important is accuracy in chemical symbols and formulas?
   a. not important at all
   b. not very important
   c. sort of important
   d. very important
THE REASON EQUATIONS MUST BE BALANCED

78. Which describes what happens to atoms in a chemical reaction?
   a. sometimes lost, never rearranged
   b. sometimes lost, gained, or rearranged
   c. never lost or gained, just rearranged
   d. lost or gained, never rearranged

Circle the letter of the best answer for each question.

79. The number of atoms in reactants and products must be what?
   a. equal
   b. less than one
   c. greater than one
   d. zero

How to Balance an Equation

80. What is a coefficient in the equation \(2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}\)?
   a. \(\text{O}_2\)
   b. 2
   c. \(\text{H}_2\text{O}\)
   d. \(\text{H}_2\)

81. What must be done for a chemical equation to be balanced?
   a. All molecules must be counted.
   b. All chemicals must be equal.
   c. All atoms must be counted.
   d. All atoms must be discounted.

Read the words in the box. Read the sentences. Fill in each blank with the word or phrase that best completes the sentence.

| coefficient | law of conservation of mass |

82. The number in front of a chemical symbol is called a

______________________.

83. According to the __________________, mass cannot be created or destroyed in ordinary chemical and physical changes.