Name_____Date _____

Due ☞ Test Day!

Pretest: Unit 3
Ionic Compounds

The following is an overview of the concepts, ideas, and problems we have covered in this unit. You are, however, responsible for all material covered, regardless if found here or not! Therefore, be sure to review all your notes, worksheets, assignments, handouts, readings, labs, problems, etc.. On the day of the test you will want to be well-acquainted with the material and organized, you will not want to waste time trying to understand an idea or searching for some needed information. Arrive prepared!

Text References:

- Chemical Formulas (Section 7.1, pages 207-215)
- Ionic Bonding (6.3)
- Metallic Bonding (6.4)

Know the following vocabulary terms listed below:

- chemical bond
- ionic bond
- covalent bond
- chemical formula
- Lewis (electron) dot structures
- binary compound
- ionic compound
- formula unit
- polyatomic ion
- monatomic ion
- oxyanion
- metallic bond
- electron sea model
- alloy

1. Use electron-dot notation to illustrate the number of valence electrons present in one atom of each of the following elements.

Li Ca Cl O

2. Use electron dot structures to illustrate the formation of ionic compounds involving the following elements:

a. Na + S

b. Ca + O

c. Mg + Cl

Forming Chemical Bonds

Use each of the terms below just once to complete the passage.

chemical bond	electrons	energy level	noble gases
nucleus	octet	ions	valence

The force that holds two atoms together is called a(n) **(1)**_____. Such an attachment may form by the attraction of the positively charged **(2)**_____ of one atom for the negatively charged **(3)**_____ of another atom, or by the attraction of charged atoms, which are called **(4)**_____. The attractions may also involve **(5)**_____ electrons, which are the electrons in the outermost **(6)**_____. The **(7)**_____ are a family of elements that have very little tendency to react. Most of these elements have a set of eight outermost electrons, which is called a stable **(8)**_____.

For each statement below, write *true* or *false*.

_____ **10.** A positively charged ion is called an anion.

_____ **11.** Elements in group 1A lose their one valence electron, forming an ion with a 1+ charge.

_____ **12.** Elements tend to react so that they acquire the electron structure of a halogen.

_____ **13.** A sodium atom tends to lose one electron when it reacts.

_____ **14.** Nonmetals form a stable outer electron configuration by losing electrons and becoming anions.

_____ **15.** A Cl^- ion is an example of a cation.

_____ **16.** The ending *-ide* is used to designate an anion.

17. In each set below, circle the ionic compound that would have the higher melting point (based on the strength of the bonds in its crystal lattice).

a. KCl KBr

b. AgCl CuCl

c. $MgCl_2$ $CaCl_2$ $AlCl_3$

d. CuO CuS ZnO ZnS

18. Underline the word that correctly describes each property in ionic compounds.

Melting point	Low	High
Boiling point	Low	High
Hardness	Hard	Soft
Brittleness	Flexible	Brittle
Electrical conductivity in the solid state	Good	Poor
Electrical conductivity in the liquid state	Good	Poor
Electrical conductivity when dissolved in water	Good	Poor

For each of the following chemical formulas, write the correct name of the ionic compound represented.

19. NaI _____

20. $CaCl_2$ _____

21. K_2S _____

22. MgO _____

23. $LiHSO_4$ _____

24. NH_4Br _____

25. Ca_3N_2 _____

26. Cs_3P _____

27. Fe_2O_3 _____

28. $Mg(ClO)_2$ _____

29. $(NH_4)_2CO_3$ _____

30. $Be_3(PO_4)_2$ _____

For each of the following ionic compounds, write the correct formula for the compound.

31. beryllium nitride _____

32. nickel(II) chloride _____

33. potassium chlorite _____

34. copper(I) oxide _____

35. magnesium sulfite _____

36. ammonium sulfide _____

37. iron(III) perchlorate _____

38. sodium nitride _____

Circle the letter of the choice that best completes the statement or answers the question.

1. An ionic bond is
- **a.** attraction of an atom for its electrons.
- **b.** attraction of atoms for electrons they share.
- **c.** a force that holds together atoms that are oppositely charged.
- **d.** the movement of electrons from one atom to another.

2. The formula unit of an ionic compound shows the
- **a.** total number of each kind of ion in a sample.
- **b.** simplest ratio of the ions.
- **c.** numbers of atoms within each molecule.
- **d.** number of nearest neighboring ions surrounding each kind of ion.

3. The overall charge of a formula unit for an ionic compound
- **a.** is always zero.
- **b.** is always negative.
- **c.** is always positive.
- **d.** may have any value.

4. How many chloride (Cl^-) ions are present in a formula unit of magnesium chloride, given that the charge on a Mg ion is 2+?
- **a.** one-half
- **b.** one
- **c.** two
- **d.** four

5. Ionic bonds generally occur between
- **a.** metals.
- **b.** nonmetals.
- **c.** a metal and a nonmetal.
- **d.** noble gases.

6. Salts are examples of
- **a.** nonionic compounds.
- **b.** metals.
- **c.** nonmetals.
- **d.** ionic compounds.

7. A three-dimensional arrangement of particles in an ionic solid is called a(n)
- **a.** crystal lattice.
- **b.** sea of electrons.
- **c.** formula unit.
- **d.** electrolyte.

8. In a crystal lattice of an ionic compound,
- **a.** ions of a given charge are clustered together, far from ions of the opposite charge.
- **b.** ions are surrounded by ions of the opposite charge.
- **c.** a sea of electrons surrounds the ions.
- **d.** neutral molecules are present.

9. What is the relationship between lattice energy and the strength of the attractive force holding ions in place?
- **a.** The more positive the lattice energy is, the greater the force.
- **b.** The more negative the lattice energy is, the greater the force.
- **c.** The closer the lattice energy is to zero, the greater the force.
- **d.** There is no relationship between the two quantities.

10. The formation of a stable ionic compound from ions
- **a.** is always exothermic.
- **b.** may be either exothermic or endothermic.
- **c.** is always endothermic.
- **d.** neither absorbs nor releases energy.

11. In electron transfer involving a metallic atom and a nonmetallic atom during ion formation, which of the following is correct?
- **a.** The metallic atom gains electrons from the nonmetallic atom.
- **b.** The nonmetallic atom gains electrons from the metallic atom.
- **c.** Both atoms gain electrons.
- **d.** Neither atom gains electrons.

12. Why do atoms bond?
    a. to gain energy
    b. to become more stable
    c. to decrease their size
    d. to gain electrons

13. When a metal combines with a nonmetal to form an ionic compound, the metal will always
    a. lose electrons
    b. gain electrons
    c. share electrons
    d. have two electrons

14. When sodium bonds with chlorine to form an ionic compound, chlorine
    a. loses electrons and becomes an anion
    b. loses electrons and becomes a cation
    c. gains electrons and becomes an anion
    d. gains electrons and becomes a cation

Chemical Formulas and Their Names

Use each of the terms below just once to complete the passage.

anion	-ate	cation	electrons
zero	lower right	monatomic	one
-ite	oxyanion	polyatomic	subscript

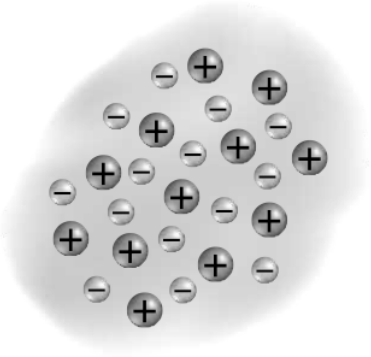
An ion with one atom is called a(n) (1)_____ ion. The charge is related to the number of (2)_____ transferred to or from the atom to form the ion. In ionic compounds, the same of the charges of all the ions equals (3)_____. Ions made up of more than one atom are called (4)_____ ions. If such an ion is negatively charged and includes one or more oxygen atoms, it is called a(n) (5)_____. If two such ions can be formed that contain different numbers of oxygen atoms, the name for the ion with more oxygen atoms ends with the suffix (6)_____. The name for the ion with fewer oxygen atoms ends with (7)_____.

In the chemical formula for any ionic compound, the chemical symbol for the (8)_____ is written first, followed by the chemical symbol for the (9)_____. A(n) (10)_____ is a small number used to represent the number of ions of a given element in a chemical formula. Such numbers are written to the (11)_____ of the symbol for the element. If no number appears, the assumption is that the number equals (12)_____.

Metallic Bonds and Properties of Metals

In your textbook, read about metallic bonds.

Use the diagram of metallic bonding to answer the following questions.



1. What is the name of the model of metallic bonding that is illustrated?

   _____

2. Why are the electrons in a metallic solid described as delocalized?

   _____

3. Which electrons from the metal make up the delocalized electrons?

   _____

4. Are the metal atoms that are shown cations or anions? How can you tell?

   _____

5. How do the metallic ions differ from the ions that exist in ionic solids?

   _____

   _____

6. Explain what holds the metal atoms together in the solid.

   _____

In your textbook, read about the properties of metals.

For each property, write *yes* if the property is characteristic of most metals, or *no* if it is not.

7. Malleable _____
8. Brittle _____
9. Lustrous _____
10. High melting point _____
11. Low boiling point _____
12. Ductile _____
13. Poor conduction of heat _____
14. Good conduction of electricity _____