

## Chemical Bonding: Reading Guide Chapters 14, 5 and 15

Directions: Your responses to the following statements need to be completed on a separate sheet of paper.

### Chapter 14

#### 14.1-14.4

1. Explain the concept of valence electrons and describe how to figure out the number of valence electrons from the electron configuration of an atom.
2. Explain why valence electrons are important in determining the chemical properties of an element.
3. Write the electron dot structure for potassium, carbon, magnesium and oxygen. Explain the meaning of the dots.
4. What is the octet rule?
5. What is a cation?
6. Write equations like the examples on page 376 which show:
  - a barium atom forming its cation
  - a potassium atom forming its cation
7. Explain why the transition metals do not have a noble gas electron configuration when they form cations.
8. What is an anion?
9. Write equations like the examples on page 378 that show:
  - a fluorine atom forming a fluoride ion
  - a sulfur atom forming a sulfide ion
10. Explain what is meant by "super plastic" steel. How is it made?
11. Use electron dot diagrams to illustrate:
  - a Li reacts with F to form LiF
  - a Mg reacts with F to form MgF<sub>2</sub>

#### 14.5-14.B

12. What are crystals? What is used to determine their structure?
13. If you have an unknown compound, how could you determine if it is an ionic substance?
14. Describe a metallic bond. Draw a picture of a metal showing the location of the valence electrons.
15. Explain why the structure of a metallic bond gives metals the following properties:
  - a good conductor of electricity
  - a ductile and malleable

16. Describe the most common arrangement of metal ions.
17. What are alloys? Explain why metals are more commonly used as alloys rather than in their pure form.
18. Why do you think that mercury is an important ingredient in dental fillings?

## **Chapter 5:**

### **5.1-5.4**

1. Describe the location of the metals and nonmetals on the periodic table. What are some properties of each?
2. What is a compound? Molecule? How are they related to cations and anions?
3. Explain the difference between molecular and ionic compounds.
4. Distinguish between chemical formula, molecular formula and formula unit. Provide an example of each.
5. What are diatomic molecules? Which elements exist as diatomic molecules?
6. Provide 3 examples of elements that would combine to form ionic compounds.
7. Provide 3 examples of elements that would combine to form molecular compounds.

### **5.5-5.6**

8. State the law of definite proportions. Explain its importance to writing formulas for compounds.
9. State the law of multiple proportions.
10. Describe some of the branches of pharmacology.
11. What types of ions are formed by groups 14 and 18? the transition metals?
12. What are the charges on silver, zinc and cadmium? Using electron configurations, explain why.

### **5.7-5.10**

13. Define polyatomic ions.
14. What is the relationship between -ate and -ite?
15. How did some compounds get their names? Provide an example.
16. Why do we not use common names today?
17. What is a binary compound? Provide an example.
18. What should you keep in mind when writing chemical formulas for ionic compounds? Write the formula for a compound composed of calcium ions and chlorine ions.
19. Which cations should you be "watchful" of when writing the names of chemical formulas? Provide an example.

## 5.11

20. Define ternary compounds.
21. Write the steps for writing the formula for a ternary compound.
22. When do you use parenthesis in writing chemical formulas? Provide an example of a formula that needs parenthesis and one that does not.
23. What are binary molecular compounds composed of? Describe the differences in writing/naming binary ionic compounds and binary molecular compounds.

## Chapter 15

1. What does hydrogen do in order to become stable?
2. Explain the difference between formula units and molecular formulas.
3. Which elements form covalent bonds?
4. Explain the octet rule and how it applies to covalent bonds.
5. How many pairs of electrons are shared by the halogens? How many unshared pairs are there?
6. Describe double and triple bonds.
7. How many valence electrons does oxygen have? Draw its Lewis dot/electron dot structure. How many covalent bonds should an oxygen molecule have?
8. How many valence electrons does nitrogen have? Draw its Lewis dot/electron dot structure. How many unshared pairs does nitrogen have?
9. How many electrons does each atom contribute in a double bond? Triple bond?
10. Which of the diatomic molecules are solids? Liquids? Gases?
11. How many electrons are shared in a water molecule? Draw its Lewis dot/electron dot structure.
12. Methane is a molecule composed of atoms of what two elements? What type of bonds are in methane?
13. Explain the promotion of electrons.
14. In general, how many electrons do atoms of the following groups share?  
4A? 5A? 6A? 7A? 8A?

15. What is a coordinate covalent bond?
16. Why do atoms form coordinate covalent bonds?
17. Draw the Lewis structure for the ammonium ion. Indicate where the +1 charge is located.
18. Draw the electron dot structures for the  $\text{SO}_4^{2-}$  and  $\text{CO}_3^{2-}$  ions. (hint: Sulfur and carbon will be the central atoms.)
19. Describe the properties and uses (or misuses) of the following covalent compounds: carbon monoxide, hydrogen peroxide, nitric oxide, nitrous oxide, hydrogen chloride.
20. Compare the benefits and hazards of sunlight.
21. Why is the incidence of skin cancer increasing?
22. Why is it unhealthy to completely cover your body from the sun?
23. Explain how the SPF scale works.
24. What is the shape of the methane molecule? Angle measures?
25. What does VSEPR theory state?
26. Explain the angle measure in a tetrahedral molecule?
27. Why are unshared pairs important to the structure?
28. Sketch and label the six possible shapes on page 413. Identify the number of unshared pairs and angle measures on each sketch.