Section Review

Objectives
- Determine the number of valence electrons in an atom of a representative element
- Explain the octet rule
- Describe how cations form
- Explain how anions form

Vocabulary
- valence electrons
- electron dot structures
- octet rule
- halide ions

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Elements within the same group of the periodic table behave similarly because they have the same number of valence electrons that element has. Diagrams that show valence electrons as dots are called electron dot structures. Gilbert Lewis’s states that in forming compounds, atoms tend to achieve the electron configuration of a noble gas.

The transfer of valence electrons produces positively charged ions, or cations, and negatively charged ions called anions. The cations of Group 1A elements always have a charge of +1. Halide ions are produced when atoms of the elements in Group 7A lose an electron. For transition metals, the charge of cations may vary.

1. _____________
2. _____________
3. _____________
4. _____________
5. _____________
6. _____________
7. _____________
8. _____________
9. _____________
10. _____________

Chapter 7 Ionic and Metallic Bonding 155
Part B True-False
Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

11. The chlorine atom gains seven electrons when it becomes an ion.  
12. The chemical properties of an element are largely determined by the number of valence electrons the element has.  
13. Atoms acquire the stable electron structure of a noble gas by losing electrons.  
14. An atom of an element in Group 1A has seven valence electrons.  
15. Among the Group 1A and 2A elements, the group number of each element is equal to the number of valence electrons in an atom of that element.  
16. Sulfur and magnesium both have two valence electrons.

Part C Matching
Match each description in Column B to the correct term in Column A.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>a. ions that are produced when halogens gain electrons</td>
</tr>
<tr>
<td>18.</td>
<td>b. a depiction of valence electrons around the symbol of an element</td>
</tr>
<tr>
<td>19.</td>
<td>c. has the electron configuration of argon</td>
</tr>
<tr>
<td>20.</td>
<td>d. an electron in the highest occupied energy level of an element’s atom</td>
</tr>
<tr>
<td>21.</td>
<td>e. Atoms in compounds tend to have the electron configuration of a noble gas</td>
</tr>
<tr>
<td>22.</td>
<td>f. atoms or groups of atoms with a negative charge</td>
</tr>
<tr>
<td>23.</td>
<td>g. atoms or groups of atoms with a positive charge</td>
</tr>
</tbody>
</table>

Part D Questions and Problems
Answer the following in the space provided.

24. Write the electron dot structures for the following atoms.

a. silicon

b. rubidium

c. barium
25. State the number of electrons lost or gained in forming each of these ions. Name the ions and tell whether it is an anion or a cation.
   a. Mg$^{2+}$
   b. Ca$^{2+}$
   c. Br$^-$
   d. Ag$^+$

26. Describe the formation of an ion from a metal and a nonmetal in terms of the octet rule.
Section Review

Objectives
• Explain the electrical charge of an ionic compound
• Describe three properties of ionic compounds

Vocabulary
• ionic compounds
• ionic bonds
• chemical formula
• formula unit
• coordination number

Part A Completion
Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

1. Anions and cations attract one another by means of _______.
2. The forces of attraction that hold _______ charged ions together in ionic compounds are called _______. Although they are composed of ions, ionic compounds are electrically _______. The lowest whole-number ratio of ions in an ionic compound is called a _______.
3. Nearly all ionic compounds are solid _______ at room temperature. Ionic compounds in general have very _______ melting temperatures. This is because the _______ attractive forces between the ions result in a very _______ structure.
4. Ionic compounds conduct an electric current when in the _______ state or dissolved in water.

Part B True-False
Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

11. During the formation of the compound NaCl, one electron is transferred from a sodium atom to a chlorine atom.
12. The coordination number of an ion is the number of ions of positive charge that surround the ion in a crystal.

13. The coordination number of the ion Na⁺ in NaCl is 6.


15. Ionic compounds cannot conduct electricity if they are dissolved in water.

Part C Matching

Match each description in Column B to the correct term in Column A.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. ionic compounds</td>
<td>a. the number of ions of opposite charge surrounding each ion in a crystal</td>
</tr>
<tr>
<td>17. ionic bonds</td>
<td>b. compounds composed of cations and anions</td>
</tr>
<tr>
<td>18. chemical formula</td>
<td>c. shows the kinds and numbers of atoms in the smallest representative unit of a substance</td>
</tr>
<tr>
<td>19. formula unit</td>
<td>d. lowest whole-number ratio of ions in an ionic compound</td>
</tr>
<tr>
<td>20. coordination number</td>
<td>e. the electrostatic forces of attraction binding oppositely charged ions together</td>
</tr>
</tbody>
</table>

Part D Questions and Problems

Answer the following in the space provided.

21. List the characteristics of an ionic bond.

22. Explain the electrical conductivity of melted and of aqueous solutions of ionic compounds using the characteristics of ionic compounds.
Section Review

Objectives

• Model the valence electrons of metal ions
• Describe the arrangement of atoms in a metal
• Explain the importance of alloys

Vocabulary

• metallic bonds
• alloys

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Metals consist of closely packed __1__ that are surrounded by a sea of __2__. This arrangement constitutes the __3__ bond. The electron mobility accounts for the excellent __4__ conductivity of metals and helps explain why metals are __5__ and __6__. Metal atoms are commonly packed in a __7__ cubic, a __8__ cubic, or a __9__ arrangement. When two or more elements, at least one of which is a metal, are mixed together, the resulting mixture is called an __10__.

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

______ 11. In a body-centered cubic structure, each atom has 12 neighbors.

______ 12. Metallic objects are formed from pure metals.
13. Metals that are good conductors of electricity are said to be ductile.

14. Drifting valence electrons insulate cations from one another and contribute to the malleability of a metal.

15. Metals are good conductors of electricity because electrons can flow freely in them.

**Part C Matching**

*Match each description in Column B to the correct term in Column A.*

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. ductile</td>
<td>a. an alloy whose component atoms are different sizes</td>
</tr>
<tr>
<td>17. metallic bonds</td>
<td>b. a mixture of two or more elements, at least one of which is a metal</td>
</tr>
<tr>
<td>18. alloy</td>
<td>c. can be hammered or forced into shapes</td>
</tr>
<tr>
<td>19. malleable</td>
<td>d. can be drawn into wires</td>
</tr>
<tr>
<td>20. interstitial alloy</td>
<td>e. the attraction of valence electrons for positive metal ions</td>
</tr>
</tbody>
</table>

**Part D Questions and Problems**

*Answer the following in the space provided.*

21. Explain the physical properties of metals, using the theory of metallic bonding.

________________________________________________________________________

________________________________________________________________________

22. Explain why the properties of alloys are generally superior to their constituent components.

________________________________________________________________________

________________________________________________________________________
IONIC AND METALLIC BONDING

Practice Problems

In your notebook, answer the following.

SECTION 7.1 IONS

1. For each element below, state (i) the number of valence electrons in the atom, (ii) the electron dot structure, and (iii) the chemical symbol(s) for the most stable ion.
   a. Ba
   b. I
   c. K

2. How many valence electrons does each of the following atoms have?
   a. gallium
   b. fluorine
   c. selenium

3. Write the electron configuration for each of the following atoms and ions.
   a. Ca
   b. chlorine atom
   c. Na⁺
   d. phosphide ion
   e. O²⁻

4. What is the relationship between the group number of the representative elements and the number of valence electrons?

5. How many electrons will each element gain or lose in forming an ion? State whether the resulting ion is a cation or an anion.
   a. strontium
   b. aluminum
   c. tellurium
   d. rubidium
   e. bromine
   f. phosphorus

6. Give the name and symbol of the ion formed when
   a. a chlorine atom gains one electron.
   b. a potassium atom loses one electron.
   c. an oxygen atom gains two electrons.
   d. a barium atom loses two electrons.

7. How many electrons are lost or gained in forming each of the following ions?
   a. Mg²⁺
   b. Br⁻
   c. Ag⁺
   d. Fe³⁺

8. Classify each of the following as a cation or an anion.
   a. Na⁺
   b. Cu²⁺
   c. I⁻
   d. O²⁻
   e. Ca²⁺
   f. Cs⁺
SECTION 7.2  IONIC BONDS AND IONIC COMPOUNDS

1. Use electron dot structures to predict the formula of the ionic compounds formed when the following elements combine.
   a. sodium and bromine
   b. sodium and sulfur
   c. calcium and iodine
   d. aluminum and oxygen
   e. barium and chlorine

2. Which of these combinations of elements are most likely to react to form ionic compounds?
   a. sodium and magnesium
   b. barium and sulfur
   c. potassium and iodine
   d. oxygen and argon

3. What is the meaning of coordination number?

4. How is the coordination number determined?

SECTION 7.3  BONDING IN METALS

1. What is a metallic bond?

2. How is the electrical conductivity of a metal explained by metallic bonds?


4. Give three possible crystalline arrangements of metals. Describe each.

5. What is an alloy?

6. Name the principal elements present in each of the following alloys.
   a. brass
   b. bronze
   c. stainless steel
   d. sterling silver
   e. cast iron
   f. spring steel
Sodium metal reacts with chlorine gas to produce a stable ionic compound. The diagram in Figure 1 is a simplified version of a Born-Haber cycle, which shows some of the steps in this chemical process. The Born-Haber cycle was introduced by the German scientists Max Born and Fritz Haber to analyze the factors contributing to the stability of ionic compounds. Note that the Born-Haber method of analysis envisions the reaction as occurring between two gaseous particles. Use the diagram to answer the following questions.

1. Write the electron configurations for sodium and chlorine. How many valence electrons does each element have?

2. Explain the event occurring in Step 1 in Figure 1.
3. Describe the event occurring in Step 2 of the Born-Haber cycle.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

4. Explain how the energetic relationships shown in Figure 1 support the observation that ionic compounds are typically hard materials with high melting points.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
# Vocabulary Review

Match the correct vocabulary term to each numbered statement. Write the letter of the correct term on the line.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>a. chemical formula</td>
</tr>
<tr>
<td>2.</td>
<td>b. valence electrons</td>
</tr>
<tr>
<td>3.</td>
<td>c. electron dot structure</td>
</tr>
<tr>
<td>4.</td>
<td>d. octet rule</td>
</tr>
<tr>
<td>5.</td>
<td>e. halide ion</td>
</tr>
<tr>
<td>6.</td>
<td>f. formula unit</td>
</tr>
<tr>
<td>7.</td>
<td>g. ionic bonds</td>
</tr>
<tr>
<td>8.</td>
<td>h. coordination number</td>
</tr>
<tr>
<td>9.</td>
<td>i. metallic bonds</td>
</tr>
<tr>
<td>10.</td>
<td>j. ionic compounds</td>
</tr>
<tr>
<td>11.</td>
<td>k. alloy</td>
</tr>
<tr>
<td>12.</td>
<td>l. anions</td>
</tr>
<tr>
<td>13.</td>
<td>m. cations</td>
</tr>
</tbody>
</table>
Chapter Quiz

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

1. When a metal atom in a metal crystal has 12 neighbors, the arrangement is a face-centered cube.
2. The chlorine atom gains seven electrons when it becomes an ion.
3. Ionic compounds conduct electricity better in the molten state than in the solid state.
4. During the formation of the compound NaCl, one electron is transferred from a sodium atom to a chlorine atom.
5. A piece of metal consists of closely packed cations surrounded by mobile valence electrons.

Fill in the word(s) that will make each statement true.

6. The electrons in the highest occupied energy level of an atom are called the _____ electrons.
7. The _____ rule states that atoms in compounds tend to have the electron configuration of a noble gas.
8. An oxygen atom attains a stable electron configuration by _____ two electrons.
9. Atoms and ions with _____ electrons in their highest energy levels are very stable.
10. Silver forms a cation by attaining a _____ electron configuration with 18 outer electrons including d electrons.
11. _____ tend to lose electrons when they react to form compounds.
12. An _____ is any atom or group of atoms with a negative charge.
13. The lowest whole-number ratio of ions in an ionic compound is known as a _____.
A. Matching

Match each description in Column B with the correct term in Column A. Write the letter of the correct description on the line.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. electron dot structure</td>
<td>a. a mixture of two or more elements, at least one of which is a metal</td>
</tr>
<tr>
<td>2. ionic compound</td>
<td>b. the number of ions of opposite charge surrounding each ion in a crystal</td>
</tr>
<tr>
<td>3. valence electron</td>
<td>c. the force of attraction binding oppositely charged ions together</td>
</tr>
<tr>
<td>4. ionic bond</td>
<td>d. the attraction of valence electrons for positive metal ions</td>
</tr>
<tr>
<td>5. chemical formula</td>
<td>e. a depiction of valence electrons around the symbol of an element</td>
</tr>
<tr>
<td>6. halide ion</td>
<td>f. compound of cations and anions</td>
</tr>
<tr>
<td>7. alloy</td>
<td>g. an anion of a halogen</td>
</tr>
<tr>
<td>8. octet rule</td>
<td>h. an electron in the highest occupied energy level of an atom</td>
</tr>
<tr>
<td>9. formula unit</td>
<td>i. Atoms in most compounds tend to achieve the electron configuration of a noble gas.</td>
</tr>
<tr>
<td>10. coordination number</td>
<td>j. shows the kinds and numbers of atoms in the smallest representative unit of a substance</td>
</tr>
<tr>
<td>11. metallic bond</td>
<td>k. lowest whole-number ratio of ions in an ionic compound</td>
</tr>
</tbody>
</table>

B. Multiple Choice

Choose the best answer and write its letter on the line.

12. How many valence electrons does an atom of any element in Group 6A have?
   a. 2  b. 4  c. 6  d. 8
13. The electron dot structure for an atom of phosphorus is
   a. \( \cdot P \cdot \)       c. \( \cdot P \cdot \)
   b. \( \cdot P \cdot \)       d. \( \cdot P \cdot \)

14. When an aluminum atom loses its valence electrons, what is the charge on the resulting ion?
   a. 2+                 c. 3+
   b. 2−                 d. 1+

15. The electron configuration of a fluoride ion, \( \text{F}^- \), is
   a. 1s\(^2\) 2s\(^2\) 2p\(^5\).
   b. the same as that of the neon atom.
   c. 1s\(^2\) 2s\(^2\) 2p\(^6\) 3s\(^1\).
   d. the same as that of a potassium ion.

16. Metals are good conductors of electricity because they
   a. form crystal lattices.
   b. contain positive ions.
   c. contain mobile valence electrons.
   d. form ionic bonds.

17. In forming chemical bonds, atoms tend to attain
   a. a state of higher energy.
   b. the electron configuration of noble gas atoms.
   c. the electron configuration of halogen atoms.
   d. all of the above

18. An ionic compound is
   a. electrically neutral.       c. composed of anions and cations.
   b. held together by ionic bonds.   d. all of the above

19. Which of these is not a characteristic of most ionic compounds?
   a. solid at room temperature
   b. has a low melting point
   c. conducts an electric current when melted
   d. produced by reaction between metallic and nonmetallic elements

20. A metallic bond is a bond between
   a. valence electrons and positively charged metal ions.
   b. the ions of two different metals.
   c. a metal and nonmetal.
   d. none of the above

21. Which element when combined with chlorine would most likely form an ionic compound?
   a. lithium       c. phosphorus
   b. carbon        d. bromine

22. A cation is any atom or group of atoms with
   a. a positive charge.
   b. no charge.
   c. a negative charge.
   d. more electrons than the corresponding atoms.
23. The cation Fe\(^{3+}\) is formed when
   a. an atom of iron loses two electrons.
   b. an atom of zinc loses two electrons.
   c. an atom of iron loses three electrons.
   d. an atom of iron gains three electrons.

C. True-False
Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

24. The chemical properties of an element are largely determined by the number of valence electrons the element has.

25. Fluorine and chlorine each have one valence electron.

26. The coordination number gives the total number of ions in a crystal.

27. Atoms acquire the stable electron structure of a noble gas by losing electrons.

28. An alloy is a mixture of two or more elements, of which at least one is a metal.

29. The crystal structure of ionic compounds such as sodium chloride is very unstable.

30. When melted, ionic compounds conduct electricity.

31. Metals are ductile because the cations in a piece of pure metal are insulated from one another by a sea of electrons.

32. Metal atoms are arranged in a face-centered cubic structure.

33. During the formation of ionic compounds, electrons are transferred from one atom to another.

D. Questions
Answer the following in the space provided.

34. Write electron dot structures for the atoms and ions of each of the following elements.

<table>
<thead>
<tr>
<th>Atoms</th>
<th>Ions</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Ca</td>
<td></td>
</tr>
<tr>
<td>b. Br</td>
<td></td>
</tr>
<tr>
<td>c. Al</td>
<td></td>
</tr>
</tbody>
</table>

35. Write the formulas obtained when each of these atoms loses or gains valence electrons and becomes an ion. Tell whether each is a cation or an anion.

   | a. Cl   | c. Na  |
   | b. Be   | d. O   |

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36. Write the complete electron configurations for the ions in problem 35.

   a. 
   b. 
   c. 
   d. 

37. Use electron dot structures to predict the structure of the ionic compound composed of aluminum and chlorine.

38. Write the electron configuration diagram that shows the transfer of electrons that takes place to form the compound sodium fluoride. Include the electron configurations of the ions formed. Which noble gas configuration does each ion have?

E. Essay

Write a short essay for the following.

39. Explain how scientists have used the concept of metallic bonding to account for many of the physical properties of metals, such as electrical conductivity and malleability.
## Chapter Test B

**A. Matching**

Match each term in Column B with the correct description in Column A. Write the letter of the correct term on the line.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. compound composed of cations and anions</td>
<td>a. halide ions</td>
</tr>
<tr>
<td>2. the forces of attraction that bind oppositely charged ions together</td>
<td>b. alloy</td>
</tr>
<tr>
<td>3. lowest whole-number ratio of ions in an ionic compound</td>
<td>c. octet rule</td>
</tr>
<tr>
<td>4. a depiction of the valence electrons as dots around the symbol for an element</td>
<td>d. formula unit</td>
</tr>
<tr>
<td>5. a mixture of two or more elements, at least one of which is a metal</td>
<td>e. electron dot structure</td>
</tr>
<tr>
<td>6. the attraction of the free-floating valence electrons for the positively charged metal ions</td>
<td>f. ionic compound</td>
</tr>
<tr>
<td>7. ions of the halogen atoms</td>
<td>g. ionic bonds</td>
</tr>
<tr>
<td>8. the electron(s) in the highest occupied energy level of an atom</td>
<td>h. coordination number</td>
</tr>
<tr>
<td>9. the number of ions of opposite charge that surround each ion in a crystal</td>
<td>i. chemical formula</td>
</tr>
<tr>
<td>10. Atoms in a compound tend to have the electron configuration of a noble gas.</td>
<td>j. valence electrons</td>
</tr>
<tr>
<td>11. Shows the kinds and numbers of atoms in the smallest representative unit of a substance</td>
<td>k. metallic bond</td>
</tr>
</tbody>
</table>
B. Multiple Choice

Choose the best answer and write its letter on the line.

12. All the elements in a particular group of the periodic table have the same number of
   a. electrons.  c. valence electrons.
   b. energy levels.  d. protons.

13. What is the number of valence electrons in an atom of Al?
   a. 13  c. 10
   b. 3  d. 8

14. Among the following, the element with six valence electrons is
   a. C.  c. O.
   b. Cs.  d. Ne.

15. The electron dot structure for Cl is
   a. \( \cdot Cl : \)  c. \( \cdot \hat{Cl} : \)
   b. \( \hat{Cl} \)  d. \( \hat{Cl} : \)

16. In general, metals react by:
   a. losing valence electrons.
   b. gaining valence electrons.
   c. sharing valence electrons.
   d. sometimes gaining and sometimes losing valence electrons.

17. An ion of K has the same electron configuration as
   a. Na\(^+\).  c. Ar.

18. The outer energy level configuration for O\(^{2-}\) is
   a. \( 2s^2 \)  c. \( 2s^2 2p^5 \).
   b. \( 2s^2 2p^4 \)  d. \( 2s^2 2p^6 \).

19. The general electron dot structure ‘X.’ could represent
   a. Li.  c. B.
   b. Na.  d. N.

20. The chemical properties of an element are largely determined by its
   a. number of energy levels.
   b. period number.
   c. number of protons.
   d. number of valence electrons.

21. Which of the following has a noble gas electron configuration?
   a. Na  c. Al\(^{3+}\)
   b. Mg\(^+\)  d. Br

22. Atoms of Ca and S would be expected to react in a ratio of
   a. 1:1.  c. 2:1.
   b. 1:2.  d. 3:1.
23. The chemical formula for the ionic compound formed when elements of Ca and N react is
   a. CaN.  
   b. Ca₂N₃.  
   c. Ca₃N₂.  
   d. Ca₅N₂.

24. In general, ionic compounds
   a. are amorphous solids at room temperature.  
   b. conduct electricity when in the solid state.  
   c. conduct electricity when they are dissolved in water.  
   d. all of the above

25. Metals typically are
   a. good conductors of electrical current.  
   b. malleable.  
   c. ductile.  
   d. all of the above

26. Which of the following is an anion?
   a. O²⁻  
   b. Mg²⁺  
   c. Al³⁺  
   d. H

27. The nonmetals in Groups 5A, 6A, and 7A
   a. lose electrons when they form ions.  
   b. form positively charged ions.  
   c. form ions with charges of 3⁻, 2⁻, and 1⁻, respectively.  
   d. form ions with a numerical charge equal to their group number.

28. Among the following, which atom is most likely to form an ion with a charge of 2⁺?
   a. O  
   b. Na  
   c. Al  
   d. Ca

C. True-False
Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

29. Among Groups 1A and 2A, the group number of each element is equal to the number of valence electrons in an atom of that element.

30. Alloys are mixtures with at least one metal.

31. In general, atoms react in an attempt to attain the electron configuration of a noble gas.

32. The loss of valence electrons from an atom produces an anion.

33. Nonmetals typically react by gaining electrons to attain noble gas electron configurations.

34. Ions have more electrons than the atoms from which they were formed.

35. In the formation of an ionic compound, a single electron is transferred from one atom to the other.
D. Questions

Answer the following in the space provided.

40. Complete the following table by providing the electron configurations for the outermost energy level, the number of valence electrons, and the electron dot structure for each of the elements given.

<table>
<thead>
<tr>
<th>Element</th>
<th>Configuration</th>
<th>No. Valence e(^-)</th>
<th>Electron Dot</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Li</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Si</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Br</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

41. Write the formula and the complete electron configuration for each of the following.

<table>
<thead>
<tr>
<th></th>
<th>Formula</th>
<th>Electron Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Na ion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. F ion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. K ion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Sr ion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

42. Write the electron dot structures for each of the following atom-ion pairs.

<table>
<thead>
<tr>
<th></th>
<th>Atom</th>
<th>Ion</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Na, Na ion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Cl, Cl ion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. P, P ion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Ca, Ca ion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
43. Write the chemical formula for the ionic compound formed when the following pairs of elements combine.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Chemical Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Na, F</td>
<td></td>
</tr>
<tr>
<td>b. Mg, Cl</td>
<td></td>
</tr>
<tr>
<td>c. Ca, S</td>
<td></td>
</tr>
<tr>
<td>d. Al, O</td>
<td></td>
</tr>
</tbody>
</table>

E. Essay

Write a short essay for the following.

44. Explain the relationship between the group number, the number of valence electrons lost or gained, and the formula of the compound that results between Ca and F.