A. Matching

Match each description in Column B with the correct term in Column A. Write the letter of the correct definition in the blank provided.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. electron dot structure</td>
<td>a. the number of ions of opposite charge surrounding each ion in a crystal</td>
</tr>
<tr>
<td>2. valence electron</td>
<td>b. the force of attraction binding oppositely charged ions together</td>
</tr>
<tr>
<td>3. ionic bond</td>
<td>c. the attraction of valence electrons for positive metal ions</td>
</tr>
<tr>
<td>4. halide ion</td>
<td>d. a depiction of valence electrons around the symbol of an element</td>
</tr>
<tr>
<td>5. octet rule</td>
<td>e. an anion of chlorine or other halogen</td>
</tr>
<tr>
<td>6. coordination number</td>
<td>f. an electron in the highest occupied energy level of an atom</td>
</tr>
<tr>
<td>7. metallic bond</td>
<td>g. Atoms in compounds tend to have the electron configuration of a noble gas.</td>
</tr>
</tbody>
</table>

B. Multiple Choice

Write the letter of the best answer in the blank.

_____ 8. How many valence electrons does an atom of any element in Group 6A have?
  a. 2
  b. 4
  c. 6
  d. 8

_____ 9. The electron dot structure for an atom of phosphorus is:
  a. \(-\cdot P\cdot\)
  b. \(-\cdot P\cdot\)
  c. \(-\cdot P\cdot\)
  d. \(-\cdot P\cdot\)

_____ 10. When an aluminum atom loses its valence electrons, what is the charge on the resulting ion?
  a. 2⁺
  b. 2⁻
  c. 3⁺
  d. 1⁺
11. The electron configuration of a fluoride ion, $F^-$, 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.

12. 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.

13. 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

14. An amalgam is a mixture of at least one substance and:
   a. lead.
   b. silver.
   c. tin.
   d. mercury.

15. An ionic compound is:
   a. generally a salt.
   b. held together by ionic bonds.
   c. composed of anions and cations.
   d. all of the above

16. 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

17. 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

C. True-False

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

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

19. Fluorine and chlorine each have one valence electron.

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


22. An alloy is a mixture of two or more elements, of which at least one is a metal.
23. The crystal structure of ionic compounds such as sodium chloride is very unstable.

24. When melted, ionic compounds conduct electricity.

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

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

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

D. Questions

Answer the following questions in the space provided.

28. 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>

29. 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 anion.

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

30. Write the complete electron configurations for the ions in problem 29.

<table>
<thead>
<tr>
<th>a.</th>
<th>b.</th>
<th>c.</th>
<th>d.</th>
</tr>
</thead>
</table>

31. Use electron dot formulas to predict the formula of the ionic compound composed of aluminum and chlorine.
32. 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.

33. 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.