Chapter 9-10 Multiple Choice—Answer Key

1. Which of these compounds is most likely to be ionic?
   A. NC\textsubscript{3}  
   B. BaCl\textsubscript{2}  
   C. CO  
   D. SO\textsubscript{2}  
   E. SF\textsubscript{4}  
   Metal + nonmetal

2. Which of these compounds is most likely to be covalent?
   A. KF  
   B. CaCl\textsubscript{2}  
   C. SF\textsubscript{4}  
   D. Al\textsubscript{2}O\textsubscript{3}  
   E. CaSO\textsubscript{4}  
   Two nonmetals

3. Complete this statement: Coulomb's law states that the magnitude of the force of interaction between two charged bodies is …
   A. directly proportional to the product of the charges on the bodies and directly proportional to the distance separating them.  
   B. directly proportional to the product of the charges on the bodies, and inversely proportional to the distance separating them.  
   C. inversely proportional to the charges on the bodies, and directly proportional to the distance separating them.  
   D. directly proportional to the sum of the charges on the bodies, and inversely proportional to the distance separating them.

4. The Lewis dot symbol for the chloride ion is
   A. :Cl\textsuperscript{+}  
   B. :Cl\textsuperscript{−}  
   C. Cl\textsuperscript{−}  
   D. Cl\textsuperscript{2+}  
   E. Cl

5. The Lewis dot symbol for the calcium ion is
   A. :Ca\textsuperscript{2+}  
   B. Ca  
   C. Ca\textsuperscript{2+}  
   D. Ca\textsuperscript{2+}  
   E. Ca

6. Which of these ionic solids would have the largest lattice energy?
   A. NaCl  
   B. NaF  
   C. CaBr\textsubscript{2}  
   D. CsI  
   E. CaCl\textsubscript{2}  
   Ca\textsuperscript{2+} with the smaller ion (r lower) & +2 charge

7. Which of these solids would have the highest melting point?
   A. NaI  
   B. NaF  
   C. MgO  
   D. MgCl\textsubscript{2}  
   E. KF  
   Two doubly-charged ions

8. Calculate the energy change for the reaction, \( \text{K(g)} + \text{I(g)} \rightarrow \text{K}^+(g) + \text{I}^-(g) \), given the following ionization energy (IE) and electron affinity (EA) values.
   \[
   \begin{array}{c|c|c}
   \text{IE} & \text{EA} \\
   \hline
   \text{K} & 419 \text{ kJ/mol} & 48 \text{ kJ/mol} \\
   \text{I} & 1,010 \text{ kJ/mol} & 295 \text{ kJ/mol} \\
   \end{array}
   \]
   A. –124 kJ/mol  
   B. –715 kJ/mol  
   C. 715 kJ/mol  
   D. 1,429 kJ/mol  
   E. none of these (419 kJ/mol – 295 kJ/mol = +124 kJ/mol)

9. Which of these elements has the greatest electronegativity?
   A. Se  
   B. Sb  
   C. K  
   D. Ga  
   E. Fe

10. Which of these elements is the least electronegative?
    A. Sr  
    B. V  
    C. Ni  
    D. P  
    E. I

11. What type of chemical bond holds the atoms together within a water molecule?
    A. Ionic bond  
    B. Nonpolar covalent bond  
    C. Polar covalent bond  
    D. Coordinate covalent bond

12. A nonpolar covalent bond (i.e., pure covalent) would form in which of these pairs of atoms?
    A. Na—Cl  
    B. H—Cl  
    C. Li—Br  
    D. Se—Br  
    E. Br—Br

13. Which of these covalent bonds is the most polar (i.e., highest percent ionic character)?
    A. Al—I  
    B. Si—I  
    C. Al—Cl  
    D. Si—Cl  
    E. Si—P

14. In which of these pairs of atoms would the bond have the greatest percent ionic character (i.e., most polar)?
    A. C—O  
    B. S—O  
    C. Na—I  
    D. Na—Br  
    E. F—F
15. Which of these compounds does not follow the octet rule?
A. NF₃       B. CO₂       C. CF₄
D. Br₂       E. NO (odd # of e⁻)

16. Use VSEPR theory to predict the shape of the PCl₃ molecule.
A. linear     B. bent      C. trigonal planar
D. trigonal pyramidal E. tetrahedral
1 lp on tetrahedral P

17. The shape of the ClF₃ molecule is best described as
A. distorted tetrahedron. B. trigonal planar.
E. trigonal pyramidal.    7 ve, 2 lp on central Cl

18. The F-Cl-F bond angles in ClF₃ are expected to be approximately
A. 90° only.    B. 109.5° only.
C. 120° only.   D. 180° only.
E. 90° and 180°. ClF₃ is T-shaped, see #17. Bond angles are actually < 90° (axial-equatorial) and < 180° (axial-axial).

19. According to the VSEPR theory, the actual F-As-F bond angles in the AsF₄⁻ ion are predicted to be
A. 109.5°.      B. 90° and 120°.  C. 180°.
D. < 109.5°.     E. < 90° and < 120°. AsF₄⁻ is see-saw shaped

20. Which one of the following molecules has a zero dipole moment?
A. CO       B. CH₂Cl₂       C. SO₃
D. SO₂       E. NH₃
SO₃ is trigonal planar, no lp.

21. Which one of the following molecules is polar?
A. PBr₅       B. CCl₄       C. BrF₅
D. XeF₂       E. XeF₄
BrF₅ is square pyramidal (1 lp on Br)

22. In which one of the following molecules is the central atom sp² hybridized?
A. SO₂       B. N₂O       C. BeCl₂
D. NF₃       E. PF₅
3 electron regions, 1 lp (AB₂E)

23. Which of the following pairs of molecules have the same geometries?
A. SF₄ and CH₄       B. CO₂ and H₂O
C. CO₂ and BeH₂       D. N₂O and NO₂
Both are linear, no lp

24. The number of pi bonds in the molecule below is
A. 2.
B. 4.
C. 6.
D. 10.
E. 15.