Practice Problems
Chapters 3, 4, 9, 10

1. An ionic bond is best described as:
   a. the sharing of electrons.
   b. the transfer of electrons from one atom to another.
   c. the attraction that holds the atoms together in a polyatomic ion.
   d. the attraction between 2 nonmetal atoms.
   e. the attraction between 2 metal atoms.

2. The empirical formula was determined to be C_4H_4O, if you know that the molecule has a mass between 130 and 140 g/mol, what is the molecular formula?

3. Which of the following is an atomic element?
   a. Br
   b. H
   c. N
   d. O
   e. Mg

4. Give the name for SnO.

5. Give the structure for sodium chlorate.
   a. NaClO
   b. $NaClO_2$
   c. $NaClO_3$
   d. $NaClO_4$

6. Calculate the molar mass of $Al(C_2H_3O_2)_3$.

7. How many N_2O_4 molecules are contained in 76.3 g N_2O_4? The molar mass of N_2O_4 is 92.02 g/mol.

8. Give the mass percent of carbon in $C_{14}H_{19}NO_2$.
   a. 38.89%
   b. 72 .07%
   c. 5.17%
   d. 2.78%

9. Determine the empirical formula for a compound that contains C, H and O. It contains 52.14% C and 34.73% O by mass.
   a. C_2H_6O
   b. CHO
   c. $C_4H_{13}O_2$
   d. CH_4O_3
   e. CH_3O

10. Which of these compounds is most likely to be ionic?
    A.   KF

    B. CCl_4
    C. CS_2
    D. CO_2
    E.   ICl

11. 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

12. Which response includes all the molecules below that do not follow the octet rule?
        (1) H_2S (2) BCl_3 (3) PH_3 (4) SF_4

    A.   (2) and (4)
    B.   (2) and (3)
    C.   (1) and (2)
    D.   (3) and (4)
    E.   (1) and (4)

13. Determine the electron geometry (eg) and molecular geometry(mg) of BCl_3.
        A. eg=trigonal planar, mg=trigonal planar
        B. eg=tetrahedral, mg=trigonal planar
        C. eg=tetrahedral, mg=trigonal pyramidal
        D. eg=trigonal planar, mg=bent
        E. eg=trigonal bipyramidal, mg= trigonal bipyramidal

14. Determine the electron geometry (eg) and molecular geometry (mg) of PCl_3^-.
        A. eg=tetrahedral, mg=bent
        B. eg=tetrahedral, mg=trigonal pyramidal
        C. eg=trigonal bipyramidal, mg=linear
        D. eg=trigonal bipyramidal, mg=trigonal planar
        E. eg=octahedral, mg=linear

15. How many of the following molecules are polar?

BCl_3 CH_3Cl SiF_4 CO_2

A. 1
B. 2
C. 3
D. 4
E. 0

16. Draw the Lewis structure for NO_2^- including any valid resonance structures.

17. What volume of 0.305 M $AgNO_3$ is required to react exactly with 155.0 mL of 0.274 M Na_2SO_4 solution? Hint: you will want to write a balanced reaction.

18. What precipitate is most likely formed from a solution containing Ba^{+2}, Na^{+1}, OH^{-1}, and CO_3^{-2}.
A) NaOH
B) $BaCO_3$
C) Na_2CO_3
D) $Ba(OH)_2$

19. According to the following reaction, what volume of 0.244 M KCl solution is required to react exactly with 50.0 mL of 0.210 M $Pb(NO_3)_2$ solution?

$$2 \text{ KCl(aq)} + Pb(NO_3)_2 \text{ (aq)} \rightarrow PbCl_2(s) + 2 \text{ KNO}_3(aq)$$
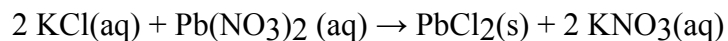
20. Is it possible for a molecule to be nonpolar even though it contains polar bonds? Explain your answer and give an example.

1. B
2. $C_8H_8O_2$
3. E
4. tin (II) oxide
5. C
6. 204.13 g/mol
7. 4.99×10^{23} N_2O_4 molecules
8. B
9. A
10. A
11. E
12. A
13. A
14. B
15. A
16. 3 possible structures
17. 278 mL
18. B
19. 86 mL
20. yes – CF_4