Chapter 8/9 (Bonding-Formulas) Test Review

1. **How is a cation ion formed? an anion?** ***loss of electrons; gain of electrons***
2. **What is the ratio of cations to anions (c:a) in the following ionic compounds?**
    a. **Ba and F** ***1:2***
    b. **Na and O** ***2:1***
    c. **Ca and N** ***3:2***
    d. **Cs and S** ***2:1***
3. **Show the electron-dot structure of the bond between Mg and P.**

$$3[Mg]^{+2} + 2[\ :\ddot{P}:\ ]^{-3}$$

4. **Describe what a metallic bond would look like magnified?** ***a sea of electrons where the delocalized electrons surround the cations***
5. **What is a chemical bond?** ***force holding two electrons together***
6. **What are the oxidation numbers of the following elements?**
    a. **O** ***-2***
    b. **Al** ***+3***
    c. **I** ***-1***
    d. **Zn** ***+2***
    e. **Ag** ***+1***
    f. **K** ***+1***
    g. **He** ***0***
7. **How are binary ionic compounds different from polyatomic ionic compounds?** ***binary ionic have atoms of two elements; polyatomic have atoms of more than two elements***
8. **What are some properties of ionic compounds in their solid state?** ***poor conductor of electricity, weak attractive forces, low boiling point, high melting point***
9. **Write the correct formula for the following ionic compounds:**

- sodium fluoride *NaF*
- lithium sulfide *Li_2S*
- Iron (III) bromide *$FeBr_3$*
- strontium iodide *SrI_2*
- potassium oxide *K_2O*
- copper (II) sulfite *$CuSO_3$*
- aluminum phosphate *$AlPO_4$*
- potassium bicarbonate (or potassium hydrogen carbonate) *$KHCO_3$*
- beryllium sulfate *$BeSO_4$*
- lithium carbonate *Li_2CO_3*

10. **Write the correct names for the following ionic compounds:**

- BeF_2 *Beryllium Fluoride*
- CuI *Copper (I) Iodide*
- $AlBr_3$ *Aluminum Bromide*
- K_2S *Potassium Sulfide*

- FeO *Iron (II) Oxide*
- NH_4Cl *Ammonium Chloride*
- Na_2SO_4 *Sodium Sulfate*
- KNO_3 *Potassium Nitrate*
- $NaCH_3COO$ *Sodium Acetate*
- $Mg(OH)_2$ *Magnesium Hydroxide*

11. What type of bond creates a molecule? ***covalent bond***

12. In the following example, label the sigma and pi bond(s).

O=O ***top is pi; bottom is sigma***

13. Of a single bond, double bond, and triple bond, which is the longest? which is the strongest? ***single-longest; triple-strongest***

14. Review your molecular geometry shapes and their bond angles.

15. Draw the NH_3 molecule and label a shared electron pair and a lone pair.

H
.. (*shared)*
H:N: (*lone)*
..
H

16. Label the type of bond that corresponds with the following electronegativity differences:

a. **0.0-0.3 → *nonpolar covalent***
b. **0.3-1.7 → *polar covalent***
c. **1.7- up → *ionic***

17. Determine the electronegativity difference and the type of bond of the following:

a. **Cl_2 *0 (nonpolar)***
b. **NH_3 *.84 (polar)***
c. **NaCl *2.23 (ionic)***

18. What are some properties of covalent bonds? ***low melting/boiling points, intermolecular forces are weak***

19. Name the following molecules?

- CO_2 *carbon dioxide*
- Cl_2O_7 *dichlorine heptaoxide*
- N_2O_5 *dinitrogen pentaoxide*

20. Write the correct formula for the following molecules?

- sulfur trioxide *SO_3*
- phosphorus pentachloride *PCl_5*
- dinitrogen tetroxide *N_2O_4*
- silicon dioxide *SiO_2*

21. What is the correct name for the following acids:

- **HCl *hydrochloric acid***
- **HNO_3 *nitric acid***

- **H_3PO_4** ***phosphoric acid***

22. What is the correct formula for the following acids:

- **carbonic acid** ***H_2CO_3***
- **chromic acid** ***H_2CrO_4***
- **hydroiodic acid HI**

23. Draw the electron dot structure for NO_3^-? see notes

24. What determines the bond strength in ionic compounds? ***greater numbers of positive and negative values***

25. Which of the following has the most bond strength?

$BaCl_2$, Al_2O_3, MgO ***Al_2O_3 because there are 2 positives and 3 negatives***

26. What type of attraction is there between the oppositely charged ions in an ionic bond? ***electrostatic***

27. Draw the electron-dot (Lewis) Structure, identify the shape, and determine the polarity of the following:

a. PCl_3 ***trigonal pyramidal, polar***

b. H_2S ***bent, polar***

c. CH_4 ***tetrahedral, nonpolar (based on shape)***

d. HI ***linear, polar***

e. I_2 ***linear, nonpolar***

28. Explain the differences between the valence electrons of ionic bonds, metallic bonds, and covalent bonds. ***ionic bond (transfer of valence electrons creating electrostatic attraction between cation and anion), metallic bond (delocalized valence electrons "swimming" between metal ions creating an attraction between cations formed and delocalized electrons); covalent bond (valence electrons shared creating molecules with specific shapes and polarities).***