Chemistry Third Marking Period Review Sheet

Spring, Mr. Wicks

Chapters 7-8: Ionic and Covalent Bonding

- I can explain the difference between core electrons and valence electrons.
- I can write Lewis dot symbols for atoms of particular elements and show the gain or loss of electrons to form ionic compounds.
- I can compare and contrast ionic and molecular compounds. See Table 1.
- I can describe ionic and covalent bonding and explain the differences between them.
- I can compare and contrast the properties of ionic and molecular compounds.
- I can predict trends in bond length when comparing carbon-carbon single, double, and triple bonds.

Table 1: Comparing Ionic and Molecular Compounds

	Ionic Compounds	***Molecular Compounds***
Bonding Type:	Ionic Bonding	Covalent Bonding
In this type of bonding, electrons are _____:	Transferred	Shared
Type(s) of Elements Involved:	Metal + Nonmetal Elements	Nonmetal Elements
Comparison of electronegativity differences:	Larger	Smaller
Comparison of Properties: **a. Melting and boiling points:** **b. Hardness:** **c. Conduction of electricity:**	a. Higher b. Harder c. When molten or dissolved in water, ionic compounds tend to conduct electricity.	a. Lower b. Softer c. Molecular compounds do not conduct electricity.

- I can apply trends for electronegativity in the periodic table to solve homework problems.
- I can use electronegativity differences to classify bonds as nonpolar covalent, polar covalent, and ionic. See Table 2.

Table 2: Classifying Bonds Using Electronegativity Differences

Electronegativity Difference	***Bond Type***
0 - 0.2	Nonpolar covalent bond
0.3 - 1.9	Polar covalent bond
$\geq$ 2.0	Ionic bond

Chemistry Third Marking Period Review Sheet, Page 2

- I can apply the octet rule to write Lewis structures for molecular compounds and polyatomic ions.
- I remember that hydrogen violates the octet rule and can never have more than two electrons around it in a Lewis structure.
- I can count the number of bonding and nonbonding electron pairs around any atom in a Lewis structure, and recognize that nonbonding pairs are sometimes called “lone pairs” of electrons.
- Drawing Lewis structures:
  1. Count the total number of valence electrons. (Remember to subtract electrons for positive ions and add electrons for negative ions.)
  2. Arrange the atoms to form a skeleton structure. Place “C” (or the least electronegative atom) in the center. Connect the atoms using pairs of electrons.
  3. Place unshared pairs of electrons around the “terminal” atoms (not the central atom) to satisfy the octet rule.
  4. Subtract the number of electrons used so far from the total number of valence electrons.
     Case 1: No electrons are left. Check to see if all atoms obey the octet rule. If yes, then you are finished! If no, go on to Case 2 or 3.
     Case 2: Not enough electrons are present for each atom to obey the octet rule. Move unshared electron pairs between atoms to create double or triple bonds.
     Case 3: There are leftover electrons after each atom obeys the octet rule. Put leftover electrons on the central atom.
- I can predict the shape of covalent molecules and polyatomic ions using Valence Shell Electron Pair Repulsion (VSEPR) Theory. I can name the electron-pair geometry and the molecular geometry.

  1. “Electron-pair geometry” refers to the structural arrangement of the ***electron pairs***:

Number of Regions of Electron Pairs	***Name of Electron-pair Geometry***	***Bond Angle(s)***	***Hybridization***
2	linear	180^o	sp
3	trigonal planar	120^o	sp^2
4	tetrahedral	109.5^o	sp^3
5	trigonal bipyramidal	90^o, 120^o	sp^3d
6	octahedral	90^o	sp^3d^2

  2. “Molecular Geometry” refers to the structural arrangement of the ***atoms***:

Structural Type	***Molecular Geometry***
AB_2	linear
AB_3	trigonal planar
AB_2E	bent
AB_4	tetrahedral
AB_3E	trigonal pyramidal
AB_2E_2	bent
AB_5	trigonal bipyramidal
AB_6	octahedral

(It is worth noting that this table is incomplete. In a more advanced chemistry course, there will be more rows to help describe geometry for additional structures that violate the octet rule.)

- Knowing the electron-pair geometry, I can determine the corresponding orbital hybridization and bond angle(s) present.
- I can use electronegativity values to determine bond polarity.
- I can combine knowledge of bond polarity and molecular geometry to predict molecular polarity.

Chemistry Third Marking Period Review Sheet, Page 3

Chapter 9: Chemical Names and Formulas

- I can use the periodic table to determine charges for ions of given elements.
- I can use the Stock system to name metal elements that can have multiple charges.
- I know the names, chemical formulas, and charges for common polyatomic ions:

OH^-	Hydroxide Ion	CO_3^{2-}	Carbonate Ion
NO_3^-	Nitrate Ion	SO_4^{2-}	Sulfate Ion
$C_2H_3O_2^-$	Acetate Ion	PO_4^{3-}	Phosphate Ion
HCO_3^-	Hydrogen Carbonate Ion (Bicarbonate Ion)	NH_4^+	Ammonium Ion
		H_3O^+	Hydronium Ion

- I can combine cations and anions to write formulas for ionic compounds.
- I can write cations and anions from formulas for ionic compounds.
- I can rapidly distinguish ionic compounds (metal and nonmetal elements) from molecular compounds (nonmetal elements only) for chemical nomenclature purposes.
- I can use the following prefixes to write the names for molecular compounds.

Mono- (1), di- (2), tri- (3), tetra- (4), penta- (5), hexa- (6), hepta- (7), octa- (8), nona- (9), deca- (10)

- I can write chemical names given chemical formulas and vice versa for ionic compounds, molecular compounds, and selected acids.

Chapter 10: Chemical Quantities

- I can calculate the molar mass for a chemical formula from the atomic masses on a periodic table of the elements.
- I can use molar masses as conversion factors to solve problems.
- I can calculate the percent composition (percent by weight) of each element in a compound based on the compound's formula.

$$\%\ Composition\ of\ an\ Element\ in\ a\ Compound = \left(\frac{Mass\ of\ Element}{Mass\ of\ Compound}\right)(100)$$

- I can solve empirical formula problems using the strategy outlined in Table 3.
- I can use percent composition to determine the empirical formula of a compound. Remember it is helpful to assume you have 100 g of a given compound during problem solving.

Table 3: Problem Solving Strategy for Empirical Formula Calculations	
1.	Get mass of each element
2.	Get moles
3.	Get mole ratio
4.	Use whole number multiplier if needed
5.	Write the empirical formula

- I can obtain a molecular formula from an empirical formula using the molar masses of both. Recall $\left(\frac{MM_{Molecular\ Formula}}{MM_{Empirical\ Formula}}\right) = Whole\ Number\ Multiplier$ needed to obtain the molecular formula.