<u>Honors Chemistry Second Marking Period Review Sheet</u>

Fall, Mr. Wicks

<u>Chapter 5: The Periodic Law</u>

- I can explain Mendeleev's and Moseley's contributions to the shape of the modern periodic table.
- I can identify the alkali metals, alkaline earth metals, transition metals, halogens, noble gases, lanthanides, and actinides on the periodic table.
- I can distinguish between the metals, nonmetals, and metalloids (or semimetals).
- I can identify the s-block, p-block, d-block, and f-block elements on the periodic table.
- I can use the periodic table as a guide to determine electron configurations for atoms and ions of particular elements.
- I can express electron configurations using noble gas notation.
- I can determine the number of protons and electrons for ions of various elements.
- I can explain the term "isoelectronic" and how it applies to different ions having the same number of electrons.
- I can predict how properties of atoms like atomic radius, ionization energy (IE), electron affinity (EA), and electronegativity change within a group or across a period of the periodic table. See Table 1.
- I can predict how atomic radius changes when atoms form ions. In general, when neutral atoms form cations, they decrease in size; when neutral atoms form anions, they increase in size.

Table 1: Atomic Properties having Periodic Table Trends

Property	***Description***
1. Atomic Radius:	Radius is one-half the distance between identical nuclei that are bonded together.
2. First Ionization Energy (IE):	The energy required to ***remove*** one electron from a neutral atom, A, of a particular element. $A + \text{energy} \rightarrow A^{+} + e^{-}$
3. Electron Affinity (EA):	The energy released when a neutral atom, A, for a particular element ***gains*** an electron. $A + e^{-} \rightarrow A^{-} + \text{energy}$
4. Electronegativity:	The ability of an atom in a molecule to attract electrons to itself.

<u>Chapter 6: Introduction to Chemical Bonding</u>

- 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 2.
- 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.

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Table 2: 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 3.

Table 3: Classifying Bonds Using Electronegativity Differences	
Electronegativity Difference	***Bond Type***
0 - 0.2	Nonpolar covalent bond
0.3 - 1.9	Polar covalent bond
≥ 2.0	Ionic bond

- I can apply to 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.

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- 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.

Chapter 7: Chemical Formulas and Chemical Compounds

- I can use the periodic table to determine charges for ions of given elements.
- 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.