Explore Student Journal

Name: _____ Date: _____

Background: Properties of Ionic and Covalent Bonds

1. What is chemical nomenclature? What is IUPAC?

_____
_____
_____

2. What are valence electrons, and what do they have to do with bonding?

_____
_____
_____

Use the diagram on this page to answer the remaining questions below:

3. What group number contains oxygen on the Periodic Table?

_____

4. How many valence electrons does oxygen have **before** bonding?

_____

5. What group number contains hydrogen on the Periodic Table?

_____

6. How many valence electrons does each hydrogen have **before** bonding?

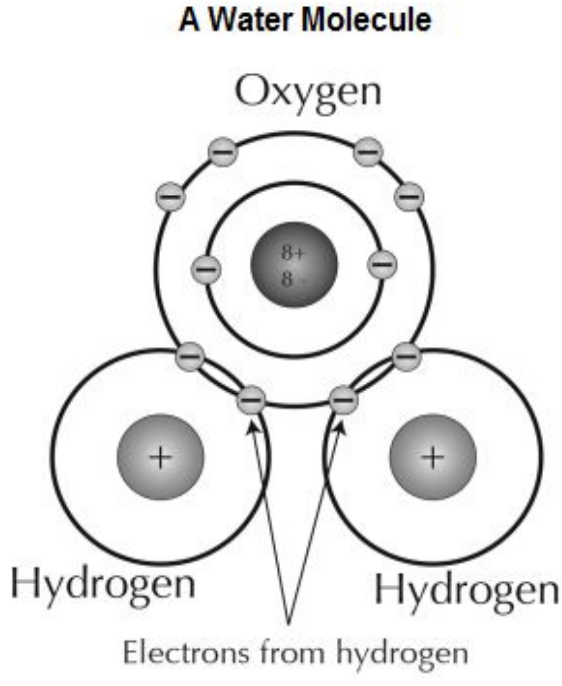
_____

7. How many valence electrons does oxygen have **after** bonding?

_____

8. How many valence electrons does each hydrogen have **after** bonding?

_____



9. How many hydrogen and oxygen atoms does the water molecule in the diagram contain?

_____

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Part I: Naming and Building Ionic Bonds

1. My Question of Inquiry:

_____
_____
_____

2. Explain what ionic bonds are and how they are created.

_____
_____
_____

3. Use your completed ionic bond puzzle pieces to complete the table below. Remember, when writing chemical formulas with polyatomic ions (ions with more than one element), you need to place parentheses around that polyatomic ion to balance charges. Use the first example in the table as a reference.

Cation Used	Anion Used	Chemical Formula	Name of Ionic Compound
Fe^{3+}	NO_3^-	$Fe(NO_3)_3$	Iron (III) nitrate

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Part I: Naming and Building Ionic Bonds, continued

4. Describe how ionic charges are used in creating chemical formulas for ionic compounds. Be specific.

_____
_____
_____

5. Describe how ionic compounds are named. What element goes first, and which goes second?

_____
_____
_____

6. When naming ionic compounds, what is critical to include with regard to the charges? In other words, how do you distinguish elements that may have multiple charges when naming ionic compounds? Use Iron as an example.

_____
_____
_____

7. Complete the table for naming and writing "Ionic Compounds."

Naming and Writing Ionic Compounds	
Compound Name	**Compound Formula**
Sodium chloride	
	$FeBr_3$
Mercury (II) chloride	
	K_3N
Silver bromide	
Copper (II) sulfate	
	$NH_4C_2H_3O_2$

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Part II: Naming Acids and Bases (Use Acid-Base Reference Chart)

1. Complete the Naming Acids Chart below. The first one has been done for you.

Naming Acids Chart				
Cation	**Anion**	**Chemical Formula**	**Name of Acid**	**Acid Type**
$\mathbf{H^+}$	Cl^-	HCl	Hydrochloric Acid	Monoprotic
$\mathbf{H^+}$		HNO_2		Monoprotic
$\mathbf{H^+}$	ClO_3^-	$HClO_3$		
$\mathbf{H^+}$	CrO_4^{2-}	H_2CrO_4		Diprotic
$\mathbf{H^+}$		H_2S		Diprotic
$\mathbf{H^+}$	PO_4^{3-}		Phosphoric Acid	Triprotic

2. Complete the Naming Bases Chart below. The first one has been done for you.

Naming Bases Chart			
Cation	**Anion**	**Chemical Formula**	**Name of Base**
$\mathbf{Na^+}$	OH^-	$NaOH$	Sodium hydroxide
	OH^-	KOH	
$\mathbf{Ba^{2+}}$	OH^-	$Ba(OH)_2$	
$\mathbf{Mg^{2+}}$	OH^-		Magnesium hydroxide
	OH^-	$Al(OH)_3$	Aluminum hydroxide

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Part III: Naming Rules for Covalent Bonds

1. Explain what covalent bonds are and how they are created.

_____

_____

_____

2. Complete the Covalent Compounds Chart.

Covalent Compounds Chart					
1st Element	**2nd Element**	**Formula**	**# of 1st Element**	**# of 2nd Element**	**Name**
C	O	CO_2	1	2	Carbon dioxide
N					Nitrogen tribromide
P		P_2O_5			Diphophorous pentoxide
N	Br		2	4	
	Cl	BCl_3	1	3	
C	F		1	4	Carbon tetrafluoride
S	O	SO_3			
H	O		2	1	(Water)
P	S		4	3	Tetraphosphorus trisulfide
Si	O	SiO_2		2	

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Part III: Naming Rules for Covalent Bonds, continued

3. Where are the elements used to create covalent compounds found on the Periodic Table, and what are these elements known as?

_____
_____
_____

4. Describe the naming system used to create covalent compounds. How is the first element named? How is the second element named?

_____
_____
_____

5. What are diatomic molecules? Name all seven of them and include their molecular formulas. Why are they diatomic?

_____
_____
_____

6. Complete the table for naming “Covalent Compounds.”

Compound Name	Compound Formula
Molecular bromine	Br_2
Molecular fluorine	
Carbon dioxide	
	SO_2
Carbon tetrachloride	
	N_2O_5
Tetraphosphorous decoxide	

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Reflection and Conclusions

1. Describe the ways in which ionic compound nomenclature differs from covalent compound nomenclature.

2. To understand chemical nomenclature, you must first organize your data. Briefly explain how you organized the data to understand and use chemical nomenclature. **(Include ionic compounds, oxyacids, nonoxyacids, and covalent compounds.)**

3. Explain how you would determine whether parentheses are necessary in the formula of an ionic compound containing a polyatomic ion. Use a specific example.

4. Using all of the following terms, develop a graphic organizer based on what you've learned in this Explore. Use another sheet of paper, if needed.

   Terms: Chemical nomenclature, IUPAC, monatomic ion, polyatomic ion, ions, ionic compound, covalent compound, molecule, diatomic molecule, chemical formula, anion, cation, acid, base, oxyacid, non-oxyacid, salt, electrolyte

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Additional Practice

Naming and Writing Compounds (and identifying type of bond)

1. Identify each of the following compounds as either an ionic compound or a covalent compound. Then name the compound. Use the *Student Reference Sheets: Summary Chart of Naming Compounds* and the Periodic Table.

Compound Formula	Ionic or Covalent Bond	IUPAC Name
LiBr		
N_2O_3		
MgS		
P_4O_{10}		
CCl_4		
$ZnSO_4$		
CO		
$SnCl_2$		
AgI		
FeO		
$BaCl_2$		
CS_2		
$CuBr_2$		

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Additional Practice

Naming and Writing Compounds, continued

2. Identify each of the following compounds with the correct IUPAC name.

Common Name	Formula	IUPAC Name
Water	H_2O	
Natural Gas	CH_4	
Deicing Salt	$CaCl_2$	
Dry Ice	CO_2	
Muriatic Acid	HCl	
Rust	Fe_2O_3	
Milk of Magnesia (a base)	$Mg(OH)_2$	
Battery Acid	H_2SO_4	
Carbonated Drinks (an acid)	H_2CO_3	
Table Salt	NaCl	
Lye (a base)	NaOH	
Baking Soda	$NaHCO_3$	
Soda Ash	Na_2CO_3	
Quicklime	CaO	

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Additional Practice

Naming and Writing Compounds, continued

3. Complete the acid/base table below with the correct formula or name.

Formula	IUPAC	Oxyacid, Non-oxyacid, or Base
HNO_3	Nitric acid	oxyacid
	Nitrous acid	
H_2SO_4	Sulfuric acid	
	Sulfurous acid	
$HClO_3$	Chloric acid	
	Chlorous acid	
HClO	Hypochlorous acid	
$HC_2H_3O_2$	Acetic acid	
HCl	Hydrochloric acid	
	Sodium hydroxide	
	Aluminum hydroxide	
	Ammonium hydroxide	

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Additional Practice

Naming and Writing Compounds, continued

4. Complete the table below with the correct formula or name. Then identify the type of bond.

Formula	IUPAC Name	Ionic or Covalent Bond
NO	Nitrogen monoxide	
N_2O		
NO_2		
N_2O_3		
N_2O_4		
N_2O_5		
CI_2	Molecular chlorine	
	Molecular iodine	
	Molecular hydrogen	
	Beryllium sulfide	
	Aluminum sulfide	
	Sodium fluoride	
	Barium hydroxide	
	Ammonium chloride	
	Cesium chloride	
	Potassium permanganate	