



Name: _____

Honors Chemistry: Unit 4 Bonding



Day	Date	Classwork	Homework
1	Thursday, March 5	After Test Introduction to Bonding (p.1-4)	Work on Periodic Table Project!!! *Bring computer if you have one*
2	Friday, March 6	PhET- Ionic & Covalent Compound Properties Types of bondings (pg. 8) Naming Molecular Compounds POGIL (p.9-12) Naming Covalent Compounds Practice WS (p.13)	Video: Naming Covalent Compounds (optional) (pg 5) Video: Lewis Structures (pg 6) Work on Periodic Table Project!!!
3	Monday, March 9	Teacher Work Day- NO SCHOOL	Video: Naming Covalent Compounds (optional) (pg 5) Video: Lewis Structures (pg 6) Work on Periodic Table Project!!!
4	Tuesday, March 10	Naming Covalent Compounds Practice WS (pg 14) Lewis Structures Classwork (p.15-18)	Video: VSEPR Theory (pg 19) Work on Periodic Table Project!!!
5	Wednesday, March 11	Quiz - Naming Molecular Compounds and Properties Fill in shapes (p.15-18) Polar/Non- Polar Notes(pg 20); Fill in P/NP (p.15-18)	VSEPR Pre-Lab Work on Periodic Table Project!!!
6	Thursday, March 12	VSEPR Lab Quiz-Molecular Compounds	Video: Naming Binary Ionic Compounds (pg 21) Video: Naming Ionic Compounds with Transition metals (pg 22) Video: Naming Ionic Compounds with Polyatomic Ions (pg 23)
7	Friday, March 13	CW: Naming Ionic Compounds (pgs 24-26)	Finish CW
8	Monday, March 16	Periodic Table Project due today in class!! Ionic Compound Naming Practice Game Quiz--Ionic Naming and Properties	Mixed Naming Practice (p.27-28)
9	Tuesday, March 17	Mixed Naming Game CW: Mixed Ionic & Covalent Compounds Worksheet (p.29)	Review-Naming Chemical Compounds (p.30)
10	Wednesday, March 18	Quiz- Mixed Naming and Properties Break out Rooms	Test Review (pg 34-38)
11	Thursday, March 19	Naming Review Bonding Properties Review Activity (pg.32-33)	Test Review (pg 34-38)
12	Friday, March 20	Unit 3 Bonding Test	

Bonding Unit Objectives:

1. Identify the properties of ionic, covalent, and metallic bonds.
2. Write the name of ions.
3. Name ionic compounds given their formulas.
4. Write the formula of ionic compounds given their names.
5. Name covalent compounds given their formulas.
6. Write the formula of covalent compounds given their names.
7. Identify all of the diatomic elements.
8. Identify the bond type given a compound.
9. Draw Lewis structures.
10. Predict the shape of a compound using VSEPR.
11. Determine whether a compound is polar or nonpolar.

CHAPTER 3 Chemical Compounds

SECTION

1

Ionic and Covalent Compounds

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What are ionic compounds?
- What are covalent compounds?

National Science Education Standards

PS 1a, 1b

What Are Ionic and Covalent Compounds?

Many things are made of combinations of elements called *compounds*. Sugar, salt, gasoline, and chalk are all compounds. They have atoms of more than one element joined together. How are the compounds alike and how are they different?

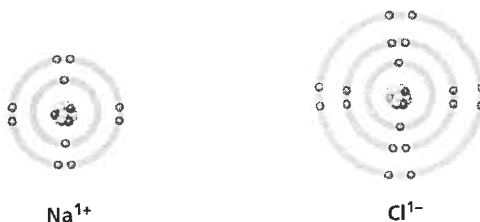
Scientists *classify*, or group, chemical compounds by the kinds of chemical bonds they have. A **chemical bond** joins atoms together to form compounds. The compounds are grouped by their bonding as either *ionic* or *covalent*.

Bonding happens between valence electrons of different atoms. *Valence electrons* are electrons in the outermost energy level of an atom. The type of compound that forms depends on what happens to the valence electrons. ✓

What Makes a Compound Ionic?

An ionic bond is an attraction between ions that have opposite charges. Compounds that have ionic bonds are called **ionic compounds**.

Ionic compounds can be formed by the chemical reaction between a metal and a nonmetal. Metal atoms become positively charged ions when electrons move from the metal atoms to the nonmetal atoms. The nonmetal atoms become negatively charged ions. ✓



A sodium atom has lost an electron to a chlorine atom. The result is a positively charged sodium ion and a negatively charged chlorine ion. The attraction of the ions is called an ionic bond.

STUDY TIP

Work in Pairs Make flash cards with all of the vocabulary words in this section. Also make flash cards of the words in *italics* in this section.

On the other side of the card, write the definition of the word. Practice saying the words and their definitions.

READING CHECK

1. Identify What determines the type of compound that forms when atoms bond?

READING CHECK

2. Describe What kind of ions do metals form? What kind of ions do nonmetals form?

SECTION 1 Ionic and Covalent Compounds *continued*

What Are the Properties of an Ionic Compound?

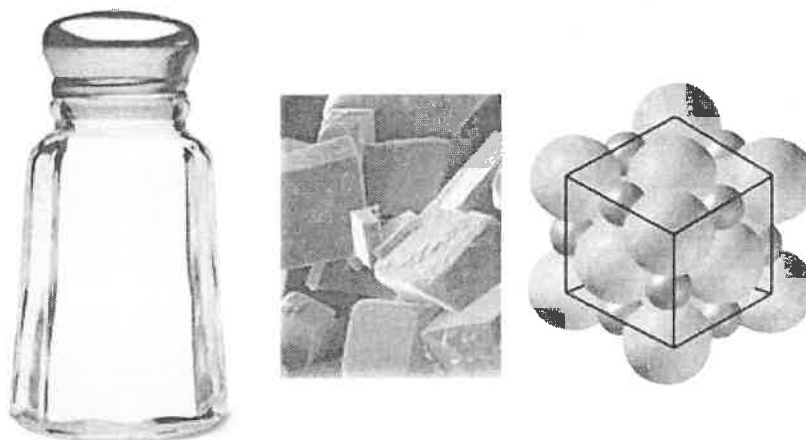
Ionic compounds form strong bonds because of the attraction between oppositely charged ions. There are several properties that tell you a compound is ionic.

IONIC COMPOUNDS ARE BRITTLE

Ionic compounds tend to be brittle at room temperature. That means they break apart when hit. They break because their ions are arranged in a pattern that happens over and over again. The pattern is called a *crystal lattice*. Each ion in a lattice bonds to the ions around it that have the opposite charge. ✓

When you hit an ionic compound, the ions move and the pattern changes. Ions that have the same charge line up and repel each other. That makes the crystals break.

Sodium chloride crystals (shown below) all have a regular cubic shape. The shape is due to the way sodium and chloride ions are arranged in the crystal lattice.



Sodium chloride crystals all have a regular cubic shape because of the way sodium and chloride ions are arranged.

IONIC COMPOUNDS HAVE A HIGH MELTING POINT

Because of the strong bonds that hold ions together, ionic compounds don't melt easily. They have a high melting point. For example, sodium chloride must be heated to 801°C before it will melt. ✓

IONIC COMPOUNDS ARE SOLUBLE

Many ionic compounds are highly *soluble* in water. That means they dissolve easily in water. Water molecules attract each of the ions of an ionic compound and pull them away from each other.

READING CHECK

3. Describe What is a crystal lattice?

READING CHECK

4. Explain What causes ionic compounds to have high melting points?

SECTION 1 Ionic and Covalent Compounds *continued***IONIC COMPOUNDS CONDUCT ELECTRICITY**

When an ionic compound dissolves in water, it forms a solution that can conduct an electric current. It conducts electricity because its ions are now free to move to complete an electric circuit. When ionic compounds are solids, their ions are not free to move. They will not conduct an electric current. ✓

What Makes A Compound Covalent?

Many of the compounds in your body are covalent compounds. **Covalent compounds** form when atoms share electrons. The bond that forms when atoms share electrons is called a *covalent bond*. Atoms share electrons to fill their outermost energy level. This forms a group of atoms, each having a full valence shell.

The group of atoms that make up a covalent compound is called a *molecule*. A molecule is the smallest particle that you can divide a compound into and still have the same compound. For example, if you break water down further, it isn't water anymore. It is hydrogen and oxygen.

What Are the Properties of Covalent Compounds?

The properties of covalent compounds are very different from the properties of ionic compounds. This table lists the properties of covalent compounds.

Properties of Covalent Compounds

Property	Description
Solubility in water	Some covalent compounds do not dissolve in water. For example, oil does not dissolve in water. When mixed with water, the water molecules stay together and the oil molecules stay together.
Melting point	Normally, covalent compounds have lower melting and boiling points than ionic compounds. This is due to weaker forces of attraction in a covalent compound than in an ionic compound.
Electrical conductivity	Most covalent compounds do not conduct electricity when dissolved in water. This is because most covalent compounds that dissolve in water form solutions that do not have ions.

READING CHECK

5. Explain Why do ionic compounds dissolved in water conduct an electric current?

STANDARDS CHECK

PS 1a A substance has characteristic properties, such as density, a boiling point, and solubility, all of which are independent of the amount of sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties.

6. Identify Give three ways covalent compounds often differ from ionic compounds.

Section 1 Review

NSES PS 1a, 1b

SECTION VOCABULARY

<p>chemical bond an interaction that holds atoms or ions together</p> <p>covalent compound a chemical compound that is formed by the sharing of electrons</p>	<p>ionic compound a compound made of oppositely charged ions</p>
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1. Compare How does the melting point of ionic compounds compare to that of covalent compounds?

2. Make Inferences Examine the table below. Use the information in the table to help you decide if the compound is ionic or covalent. Write *ionic* or *covalent* in the box next to each compound.

Compound	Property	Ionic or covalent
A	low melting point	
B	smallest particle is a molecule	
C	water solution conducts an electric current	
D	high melting point	

3. Describe Why do ionic compounds tend to be brittle?

4. Explain Solid crystals of ionic compounds do not conduct an electric current. Why does the solution conduct electricity when the crystals dissolve in water?

5. Describe Describe how a metal and a nonmetal can combine by forming an ionic bond.

Naming Covalent Compounds

Lewis Structures

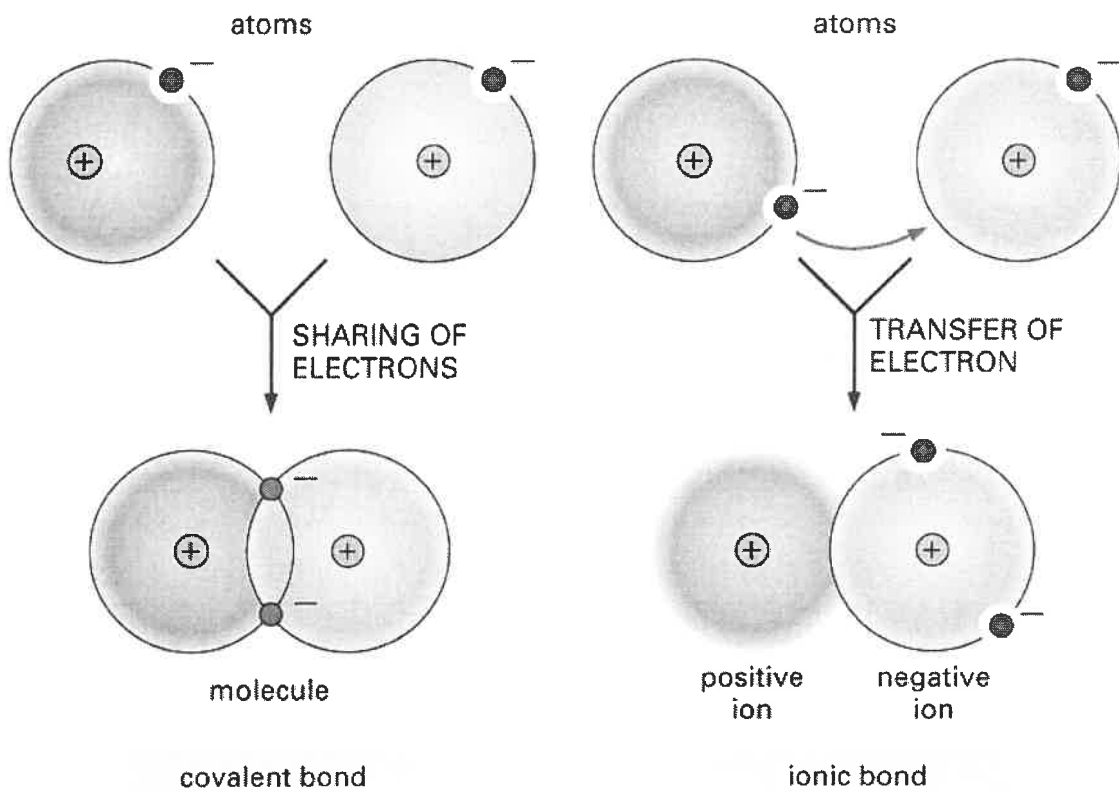
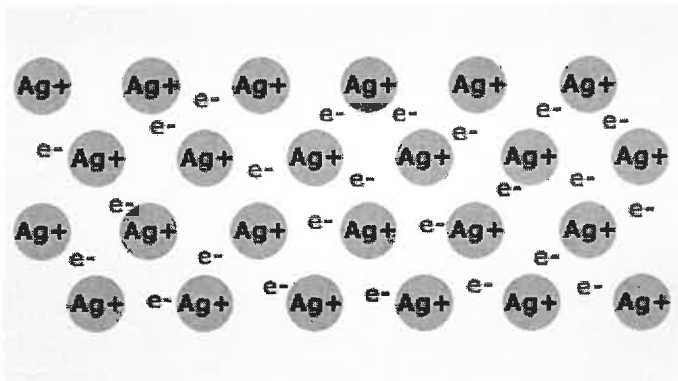


Figure 2.6 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Metallic Bond



Chemical Bonding

Ionic Bond	between a Metal and Non-Metal	(M + NM)
Covalent Bond	between a Non-Metal and Non-Metal	(NM + NM)
Metallic Bond	between a Metal and Metal	(M + M)

Determine if the elements in the following compounds are metals or non-metals. Describe the type of bonding that occurs in the compound.

Compound	Element 1 (metal or non-metal?)	Element 2 (metal or non-metal?)	Bond Type
NO ₂	N = non-metal	O = non-metal	covalent
NaCl			
SO ₂			
PO ₄ ³⁻			
MgBr ₂			
CaO			
H ₂ O			
K ₂ O			
Cu-Zn alloy			
O ₂			
CuCl ₂			
NO ₂ ⁻			
TiO ₂			
HF			
Rb ₂ S			
Au-Ag mixture			
Fe ₂ O ₃			
C ₆ H ₁₂ O ₂₂			

Naming Molecular Compounds

How are the chemical formula and name of a molecular compound related?

Why?

When you began chemistry class this year, you probably already knew that the chemical formula for carbon dioxide was CO_2 . Today you will find out why CO_2 is named that way. Naming chemical compounds correctly is of paramount importance. The slight difference between the names carbon monoxide (CO , a poisonous, deadly gas) and carbon dioxide (CO_2 , a greenhouse gas that we exhale when we breathe out) can be the difference between life and death! In this activity you will learn the naming system for molecular compounds.

Model 1 – Molecular Compounds

Molecular Formula	Number of Atoms of First Element	Number of Atoms of Second Element	Name of Compound
ClF			Chlorine monofluoride
ClF_5	1	5	Chlorine pentafluoride
CO			Carbon monoxide
CO_2			Carbon dioxide
Cl_2O			Dichlorine monoxide
PCl_5			Phosphorus pentachloride
N_2O_5			Dinitrogen pentoxide

- Fill in the table to indicate the number of atoms of each type in the molecular formula.
- Examine the molecular formulas given in Model 1 for various molecular compounds.
 - How many different *elements* are present in each compound shown?
 - Do the compounds combine metals with metals, metals with nonmetals, or nonmetals with nonmetals?
 - Based on your answer to *b*, what type of bonding must be involved in molecular compounds?
- Find all of the compounds in Model 1 that have chlorine and fluorine in them. Explain why the name “chlorine fluoride” is not sufficient to identify a specific compound.
- Assuming that the name of the compound gives a clue to its molecular formula, predict how many atoms each of these prefixes indicates, and provide two examples.
mono-
di-
penta-

Model 2 – Prefixes and Suffixes

Prefix	Numerical Value
mono-	
di-	
tri-	
tetra-	
penta-	
hexa-	
hepta-	
octa-	
nona-	
deca-	

Molecular Formula	Name of Compound
BCl_3	Boron trichloride
SF_6	Sulfur hexafluoride
IF_7	Iodine heptafluoride
NI_3	Nitrogen triiodide
N_2O_4	Dinitrogen tetroxide
Cl_2O	Dichlorine monoxide
P_4O_{10}	Tetraphosphorus decoxide
B_5H_9	Pentaboron nonahydride
Br_3O_8	Tribromine octoxide
ClF	Chlorine monofluoride

- Examine the prefixes in Model 2. Fill in the numerical value that corresponds to each prefix.
- What suffix (ending) do all the compound names in Model 2 have in common?




- Carefully examine the names of the compounds in Model 2. When is a prefix NOT used in front of the name of an element?
- Consider the compound NO.
 - Which element, nitrogen or oxygen, would require a prefix in the molecule name? Explain your answer.

b. Name the molecule NO.

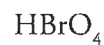


- Find two compounds in Model 2 that contain a subscript of “4” in their molecular formula.
 - List the formulas and names for the two compounds.
 - What is different about the spelling of the prefix meaning “four” in these two names?

10. Find two compounds in Model 2 that contain the prefix “mono-” in their names.
- List the formulas and names for the two compounds.
 - What is different about the spelling of the prefix meaning “one” in these two names?
11. Identify any remaining names of compounds in Model 2 where the prefixes that do not exactly match the spelling shown in the prefix table.
12. Use your answers to Questions 9–11 to write a guideline for how and when to modify a prefix name for a molecular compound. Come to a consensus within your group.
13. Would the guideline you wrote for Question 12 give you the correct name for NI_3 as it is given in Model 2? If not, modify your guideline to include this example.
14. All of the compounds listed in Model 2 are binary molecular compounds. Compounds such as CH_3OH or PF_2Cl_3 are not binary, and compounds such as NaCl or CaCl_2 are not molecular. Propose a definition for “binary molecular compounds.”
-  15. Collaborate with your group members to write a list of rules for recognizing and naming binary molecular compounds from their chemical formulas.



16. For each of the following compounds, indicate whether or not your naming rules from Question 15 will apply. If not, explain why the naming rules do not apply.



17. Using the rules your group developed in Question 15, name each of the following molecular compounds.

Molecular Formula	Molecule Name
PBr_3	
SCl_4	
N_2F_2	
SO_3	
BrF	

18. Write molecular formulas for the following compounds.

Molecular Formula	Molecule Name
	Disulfur decafluoride
	Carbon tetrachloride
	Oxygen difluoride
	Dinitrogen trioxide
	Tetraphosphorus heptasulfide



Covalent Compounds

_____ 1. carbon dioxide

_____ 2. dinitrogen pentoxide

_____ 3. diphosphorus pentoxide

_____ 4. dinitrogen monoxide

_____ 5. dinitrogen tetroxide

_____ 6. phosphorus pentoxide

_____ 7. carbon tetrachloride

8. P_4O_{10} _____

9. S_2O_3 _____

10. CS_2 _____

11. SO_2 _____

12. BF_3 _____

13. PO_2 _____

14. $SiCl_4$ _____

C. NmNm

1) Name of 1st element (with prefix if more than one atom)

2) prefix for number of atoms- root of nonmetal name -ide ending

mon(o)- 1	tri- 3	penta-5	hepta-7	nona-9
di- 2	tetra- 4	hex(a)- 6	octa-8	deca-10

ex. N₂O dinitrogen monoxide; NO₂ nitrogen dioxide

Name the following:

1. SO₃ _____

2. AsCl₃ _____

3. N₂O₃ _____

4. P₂O₅ _____

5. GeCl₄ _____

6. XeF₆ _____

7. SF₄ _____

8. NO₃ _____

9. SiO₂ _____

10. CO _____

Write formulas for the following:

11. Sulfur dioxide _____

12. Phosphorous trichloride _____

13. Nitrogen monoxide _____

14. Carbon tetrafluoride _____

15. Dinitrogen pentoxide _____

16. Sulfur trioxide _____

17. Carbon monoxide _____

18. Phosphorous pentachloride _____

19. Arsenic tribromide _____

20. Nitrogen triiodide _____

Lewis Structures Classwork

	Molecule	Lewis Structure	Bonded Atoms	Lone Pairs	Shape	P/NP
1.	SeH ₂					
2.	BF ₃					
3.	H ₂ O					
4.	CCl ₄					
5.	NH ₃					
6.	AsF ₅					
7.	NH ₂ ¹⁻					

	Molecule	Lewis Structure	Bonded Atoms	Lone Pairs	Shape	P/NP
8.	CO ₂					
9.	NO ₃ ¹⁻					
10.	HCN					
11.	Gal ₃					
12.	SO ₃					
13.	CO ₃ ²⁻					
14.	NCl ₃					

	Molecule	Lewis Structure	Bonded Atoms	Lone Pairs	Shape	P/NP
15.	CS_2					
16.	HOCl					
17.	PH_3					
18.	SF_6					
19.	SO_3^{2-}					
20.	SF_4					
21.	ICl_2^-					

	Molecule	Lewis Structure	Bonded Atoms	Lone Pairs	Shape	P/NP
22.	PCl_2F_3					
23.	SF_2					
24.	XeF_4					

VSEPR Theory

Polar + NonPolar

Naming Binary Ionic Compounds

Naming Ionic with Transition Metals

Naming Ionic with Polyatomic Ions

Writing Formulas & Naming Compounds

I. Binary Compounds

A. MNm

- 1) name of 1st element
- 2) root of name of 2nd element with -ide ending

Ex. CaO calcium oxide
K₂S potassium sulfide

Name the following:

Write formulas for the following

1. NaF _____

11. Aluminum chloride _____

2. K₂O _____

12. Lithium sulfide _____

3. LiBr _____

13. Calcium phosphide _____

4. CaCl₂ _____

14. Barium fluoride _____

5. BaS _____

15. Potassium oxide _____

6. BaF₂ _____

16. Sodium bromide _____

7. Na₂S _____

17. Barium nitride _____

8. MgI₂ _____

18. Lithium oxide _____

9. K₃N _____

19. Aluminum oxide _____

10. BeSe _____

20. Rubidium iodide _____

B. TmNm

- 1) name of Transition **m**etal with Roman numeral
- 2) root of nonmetal with -ide ending

Ex. CuO copper (II) oxide
Fe₂O₃ Iron (III) oxide

Name the following:

1. CuCl _____

2. CuCl₂ _____

3. FeO _____

4. MnS _____

5. Cr₂O₃ _____

6. NiF₂ _____

7. SnCl₄ _____

8. Ag₃P _____

9. ZnS _____

10. HgCl₂ _____

Write formulas for the following:

11. Mercury (II) sulfide _____

12. Copper(II) nitride _____

13. Iron(III) bromide _____

14. Mercury(I) oxide _____

15. Silver fluoride _____

16. Copper(II) oxide _____

17. Chromium(III) oxide _____

18. Nickel(II) bromide _____

19. Tin (IV) sulfide _____

20. Zinc oxide _____

II. Compounds with Polyatomic Ions (ternary)

- name the 2 parts (ion names)

Ex. NH_4Cl ammonium chloride
 $\text{Ca}(\text{NO}_3)_2$ calcium nitrate

Name the following:

Write the formulas for the following:

1. $(\text{NH}_4)_2\text{CO}_3$ _____

11. Aluminum sulfate _____

2. BaSO_4 _____

12. zinc nitrite _____

3. Li_2SO_3 _____

13. Magnesium chlorate _____

4. CrPO_4 _____

14. Sodium bicarbonate _____

5. $\text{NaC}_2\text{H}_3\text{O}_2$ _____

15. Calcium hydroxide _____

6. $\text{Ba}(\text{OH})_2$ _____

16. Copper (II) carbonate _____

7. $\text{Fe}(\text{NO}_3)_3$ _____

17. Ammonium sulfide _____

8. KCN _____

18. Iron (III) acetate _____

9. SrCrO_4 _____

19. lithium sulfate _____

10. CaCr_2O_7 _____

20. Strontium phosphate _____

Mixed Compound Practice

Part I.

(1) Circle the Ionic Compounds (2) Write out the name for the following compounds.

1. NaCl _____

2. MnS _____

3. K₂O _____

4. CuBr₂ _____

5. CuBr _____

6. CO₂ _____

7. PbSO₄ _____

8. Li₂CO₃ _____

9. Na₂CO₃ _____

10. NO₂ _____

11. N₂O₄ _____

12. Ca(OH)₂ _____

13. NH₄Cl _____

14. SO₃ _____

15. AlPO₄ _____

16. CCl₄ _____

17. CaS _____

18. NH_3 _____

19. MgI_2 _____

20. K_3PO_4 _____

Part II.

(1) Circle the ionic compounds. (2) Write the formulas for the following compounds. Helpful hint: for ionic compounds write the ions with their charges first then write the final answer.

1. Ammonium phosphate _____

2. Iron (II) oxide _____

3. Iron (III) oxide _____

4. Carbon monoxide _____

5. Calcium chloride _____

6. Potassium nitrate _____

7. Magnesium hydroxide _____

8. Aluminum sulfate _____

9. Copper (II) sulfate _____

10. Lead (IV) chromate _____

11. Diphosphorus pentoxide _____

12. Potassium permanganate _____

13. Sodium hydrogen carbonate _____

14. Zinc nitrate _____

15. Aluminum sulfite _____

Mixed Ionic & Covalent Compounds

First identify if the compound is ionic (I) or covalent (C), then either name it OR write the compound.

1. _____ aluminum nitrate _____
2. _____ $\text{Sr}_3(\text{PO}_3)_2$ _____
3. _____ Carbon dioxide _____
4. _____ P_4O_{10} _____
5. _____ sodium permanganate _____
6. _____ Na_2O_2 _____
7. _____ Dinitrogen pentoxide _____
8. _____ S_2O_3 _____
9. _____ chromium(II) sulfate _____
10. _____ Mg_3N_2 _____
11. _____ Diphosphorus pentoxide _____
12. _____ CS_2 _____
13. _____ sodium bromide _____
14. _____ $\text{Al}_2(\text{SO}_3)_3$ _____
15. _____ Dinitrogen monoxide _____
16. _____ SO_2 _____
17. _____ potassium nitrite _____
18. _____ Fe_2S_3 _____
19. _____ Dinitrogen tetroxide _____
20. _____ PCl_5 _____
21. _____ barium hydrogen sulfate _____
22. _____ Al_2O_3 _____
23. _____ Trinitrogen monosulfide _____
24. _____ H_2S _____
25. _____ nickel(III) chlorite _____
26. _____ $\text{Pb}(\text{NO}_3)$ _____
27. _____ Carbon tetrafluoride _____

Review– Naming Chemical Compounds

The following are a good mix of naming and formula writing problems to help you get some practice.

Name the following chemical compounds:

- 1) NaBr _____
- 2) $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ _____
- 3) P_2O_5 _____
- 4) $\text{Ti}(\text{SO}_4)_2$ _____
- 5) FePO_4 _____
- 6) K_3N _____
- 7) SO_2 _____
- 8) CuOH _____
- 9) $\text{Zn}(\text{NO}_2)_2$ _____
- 10) V_2S_3 _____

Write the formulas for the following chemical compounds:

- 11) silicon dioxide _____
- 12) nickel (III) sulfide _____
- 13) manganese (II) phosphate _____
- 14) silver acetate _____
- 15) diboron tetrabromide _____
- 16) magnesium sulfate _____
- 17) potassium carbonate _____
- 18) ammonium oxide _____
- 19) tin (IV) selenide _____
- 20) carbon tetrachloride _____

Mixed Up Ionic Compounds ☺ (M^+NM^-)

1. State the number of electrons lost or gained when these elements form ions. Be sure to specify whether the electrons are lost or gained.

a) Br _____ b) Cu _____ c) Ca _____

2. Write the formulas of the ions for these elements

a) potassium _____ b) beryllium _____ c) sulfide _____

3. Write the formula and charge of each of the following ions.

a) ammonium _____ b) nitrate _____ c) Tin (II) _____

4. Write formulas for compounds formed from these pairs of ions.

a) Ba^{2+} , S^{2-} _____ b) Ca^{2+} , N^{3-} _____

5. Write formulas for these compounds

a) sodium iodide _____ b) potassium sulfide _____

c) tin (II) fluoride _____ d) calcium iodide _____

e) lithium hydrogen sulfate _____ f) chromium(III) nitrite _____

g) barium hydroxide _____ h) sodium bromide _____

6. Name these compounds.

a) ZnS _____ b) BaO _____

c) $NaClO_2$ _____ d) SnO_2 _____

e) $Fe(C_2H_3O_2)_2$ _____ f) K_2CrO_4 _____

g) CaO _____ h) $Ba_3(PO_4)_2$ _____

31 - optional

Introduction to Bonding

1. Chemical Bond-

2. Most atoms form chemical bonds because _____

Bonding Comparison Chart

	IONIC	COVALENT	METALLIC
Types of Atoms Involved (metal or nonmetal)			
Method of Bond Formation (transfer of electrons, sharing of electrons, or sea of electrons)			
Type of Structure			
Physical State (solid, liquid, or gas)			
Melting Point (high or low)			
Soluble in Water? (yes or no)			
Conducts Electricity? (yes or no)			
Other Properties (give at least two that have NOT already been given)	1. 2.	1. 2.	1. 2.
Image of what the bonding looks like (Draw it!)			

Multiple Choice Questions

1. In which type of bond are electrons shared between atoms?
 A. Ionic B. Covalent C. Metallic
2. Which type of bond creates a crystalline structure?
 A. Ionic B. Covalent C. Metallic
3. Which type of bond usually forms between two nonmetals?
 A. Ionic B. Covalent C. Metallic
4. Which type of bond forms a structure which is often described as an "electron sea"?
 A. Ionic B. Covalent C. Metallic
5. Which bond is characterized by the formation of oppositely charged particles?
 A. Ionic B. Covalent C. Metallic
6. In which type of bond are one or more electrons transferred from one atom to another?
 A. Ionic B. Covalent C. Metallic
7. Which of the following is NOT a characteristic of ionic substances?
 A. Conduct electricity in solution form.
 B. Have high melting points.
 C. Usually dissolve in water.
 D. Are usually gases at room temperature.
8. Which of the following is NOT a characteristic of metallic substances?
 A. Are lustrous, malleable, and ductile.
 B. Conduct electricity.
 C. Have low melting points.
 D. Are usually solids at room temperature.
9. Which of the following is NOT a characteristic of covalent substances?
 A. Have low melting points.
 B. Sometimes dissolve in water.
 C. Usually form small, individual molecules.
 D. Conduct electricity.
10. Why do atoms form chemical bonds?
 A. To increase their potential energy. B. To become more stable.
 C. To gain more valence electrons. D. To obtain a higher electronegativity.

Bonding Test Review

Name: _____

1. Write the formulas for the compounds formed from these pairs of ions.
 - a. Ba^{2+} , Cl^- _____
 - b. Ag^+ , I^- _____
 - c. Ca^{2+} , S^{2-} _____
 - d. K^+ , Br^- _____
 - e. Al^{3+} , O^{2-} _____
 - f. Fe^{2+} , O^{2-} _____

2. Write formulas for compounds formed from these pairs of ions.
 - a. NH_4^+ , SO_4^{2-} _____
 - b. K^+ , NO_3^- _____
 - c. Barium ion and hydroxide ion _____
 - d. Lithium ion and carbonate ion _____

3. Name the following ionic compounds.
 - a. MnO_2 _____
 - b. Li_3N _____
 - c. SrBr_2 _____
 - d. K_2S _____
 - e. CuCl_2 _____
 - f. SnCl_4 _____

4. Write formulas for the following ionic compounds.
 - a. sodium phosphate _____
 - b. magnesium sulfate _____
 - c. sodium hydroxide _____
 - d. potassium cyanide _____
 - e. ammonium chloride _____

f. potassium dichromate _____

5. Name the following compounds.

a. NaCN _____

b. FeCl₃ _____

c. Na₂SO₄ _____

d. K₂CO₃ _____

e. Cu(OH)₂ _____

f. LiNO₃ _____

6. Name the following covalent compounds.

a. PCl₅ _____

b. CCl₄ _____

c. NO₂ _____

d. XeF₂ _____

e. SiO₂ _____

f. Cl₂O₇ _____

7. Write the formulas for the following covalent compounds.

a. nitrogen tribromide _____

b. dichlorine monoxide _____

c. sulfur dioxide _____

d. dinitrogen tetrafluoride _____

Bonding Properties

Property	Ionic	Covalent	Metals
Luster			
Malleability			
Ductility			
Melting Point			
Solubility			
Ability to conduct electricity as solid			
Ability to conduct electricity as liquid			
Use of electrons in bonding			

Lewis Structure & VSEPR Theory

Complete the following charts:

Shape	Bonded Atoms	Lone Pairs	Sketch of Shape
Linear			
Bent			
Trigonal Planar			
Trigonal Pyramidal			
Tetrahedral			
Trigonal bipyramidal			
See Saw			

T Shape						
Octahedral						
Square pyramidal						
Square planar						
Compound	Formula	Lewis Structure	Bonded Atoms	Lone Pairs	Shape	P / NP
8. boron tribromide Val e- _____						
9. Carbon dioxide Val e- _____						
10. Water Val e- _____						
11. Silicon tetrachloride Val e- _____						
12. Phosphorus trihydride Val e- _____						
13. Dichlorine monoxide Val e- _____						

14. Arsenic pentafluoride						
Val e- _____						
15. Phosphate ion						
Val e- _____						
16. Sulfur hexahydride						
Val e- _____						
17. Selenium hexachloride						
Val e- _____						
18. Iodine pentafluoride						
Val e- _____						
19. Krypton tetrabromide						
Val e- _____						