

Unit 5: Naming and Bonding

Name: _____ Block: _____

Learning Targets

- Review: I CAN determine the number of valence electrons of main group elements using the periodic table; I CAN determine the charge (oxidation number) of a given ion using the periodic table
- I CAN draw the Lewis Dot Structure of an atom; I CAN draw the Lewis Structure of an ion
- I CAN define and explain ionic compounds (formation and composition) and their properties; I CAN draw the Lewis Dot Structure for an ionic compound
- Given the two elements bonding, I CAN write the name and formula of any given ionic compound.
**Includes simple ionic compounds, compounds with transition metals, and compounds with polyatomic ions.*
- I CAN write the formula (including charge) and name of the required polyatomic ions
- I CAN define and explain covalent molecules (formation and composition) and their properties; I CAN draw the Lewis Dot Structure for a covalent molecule
**Includes binary acids, oxyacids, and simple straight-chained hydrocarbons (alkanes).*
- Given the two elements bonding, I CAN write the name and formula of any given covalent molecule.
**Includes binary acids, oxyacids, and simple straight-chained hydrocarbons (alkanes).*
- I CAN define and explain structural isomers.
- Given the formula or name, I CAN determine if a compound contains ionic or covalent bonds.
**Includes binary acids, oxyacids, and simple straight-chained hydrocarbons.*

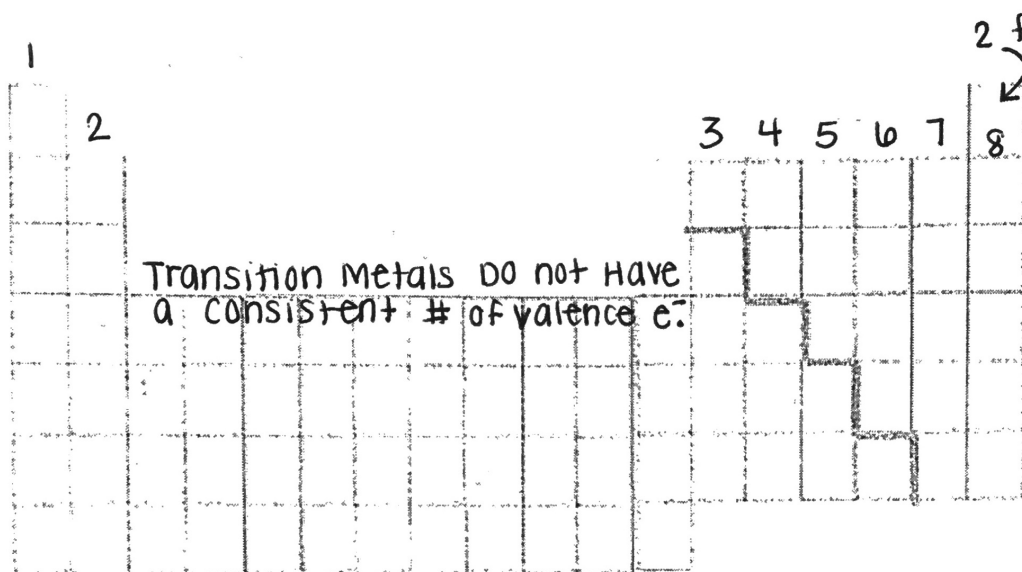
Chemistry Important Dates!

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
February 20	21	22	23	24	25	26
27	28	March 1	2	3	4	5
6	7	8	9	10	11	12

Review: Valence Electrons

Remember the number of valence electrons of a main group are counted from 1-8, left to right in groups 1 and 2, 13-18.

Directions: On the periodic table below, label each Main Group with the number of valence electrons, then answer the question to the right of the table.



How many valence electrons do the following atoms/ions have?

- Ca 2
- Ca⁺² 8
- S 6
- S⁻² 8
- He 2
- Ne 8

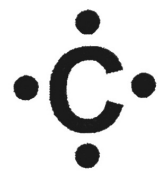
Lewis Dot Rules for Atoms

Electron distribution is depicted with Lewis Dot Structures (also known as electron dot structures). These are the rules for drawing Lewis Dot Structures:

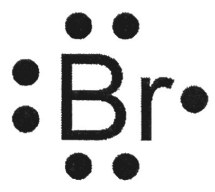
1. Write the symbol of the element the Lewis Dot will represent.
2. The dots around the symbol represent the number of valence electrons that element has.
 - Be sure to follow these simple rules when adding dots around the symbol:
 1. No side receives two electrons until each side receives one (seats on a bus, remember?)
 2. Once all four sides have one electron, begin to fill the second electron spot in each pair.
 3. It does not matter which side you start on, as long as the previous two rules are fulfilled.

Example:

Carbon (4 valence electrons)



Bromine (7 valence electrons)



Directions: Draw the Lewis Dot Structure for the following atoms:



Common Ions (Oxidation Numbers)

Octet Rule: Each atom will gain or lose valence electrons to achieve 8 valence electrons in the outermost energy level so that they achieve the electron configuration of a Noble Gas (group 18).

Ions form by gaining or losing valence electrons to become more stable.

Cations: positively charged ions that will lose electrons to become more stable. There are more protons than electrons.

Anions: negatively charged ions that will gain electrons to become more stable. There are more electrons than protons.

Directions: On the periodic table below, write the common ions (oxidation numbers) formed by each group. As before, ignore groups 3-12. Then, answer the question to the right of the table.

+1												+3	+4	-3	-2	-1	∅
	+2																
	Transition metals do not have consistent common ions																

What are the common ions formed by the following atoms?

H +1

Ca +2

Al +3

N -3

O -2

F -1

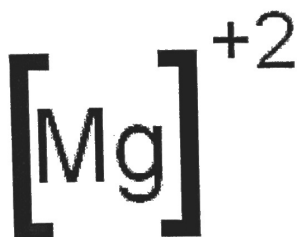
Li +1

Lewis Dot Rules for Ions

When drawing the Lewis Dot Structures, you will signify that they symbol is an ion by completing the Octet Rule using the appropriate amount of dots, then adding brackets around the symbol with the charge outside right as a superscript.

Example:

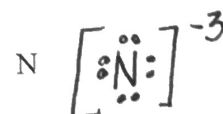
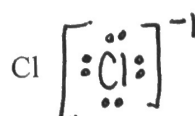
Magnesium (+2 common ion)



Bromine (-1 common ion)

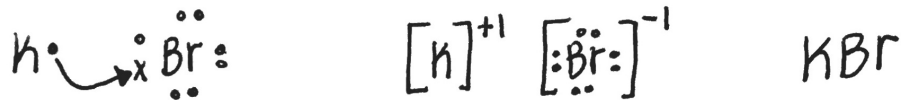


Directions: Draw the Lewis Dot Structures for the following common ions:

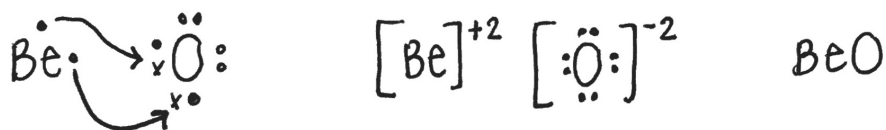


Directions: Draw the ionic bonding between the elements in each example below. Use the example as a guide and complete all steps (1-5).

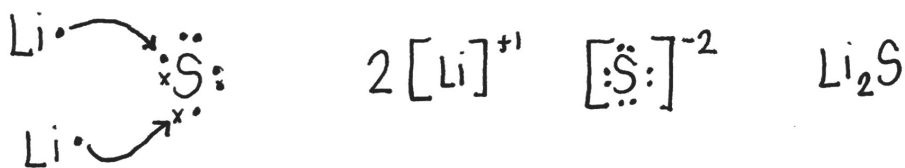
Potassium and Bromine



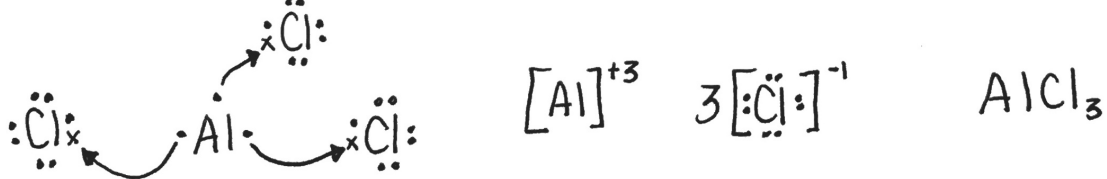
Beryllium and Oxygen



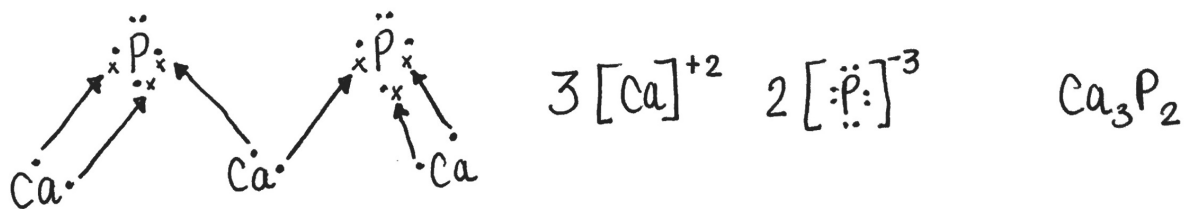
Lithium and Sulfur



Aluminum and Chlorine



Calcium and Phosphorous



Compound Type: Binary Ionic compound



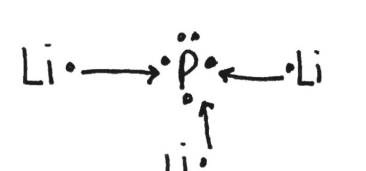
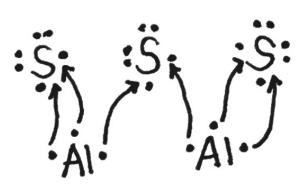
ions: Using the table below, determine a process to go from Name to Chemical Formula, and back. List your findings at the bottom of the page. Make sure your process is CLEAR!

What do you notice about the element named first? What do you notice about the ending to the name? What do you notice about the ions involved? What do you notice about the final chemical formula?

Name	Formation	Chemical Formula
sodium chloride	Na^{+1} and Cl^{-1}	NaCl
sodium sulfide	2Na^{+1} and S^{-2}	Na_2S
sodium nitride	3Na^{+1} and N^{-3}	Na_3N
magnesium chloride	Mg^{+2} and 2Cl^{-1}	MgCl_2
magnesium oxide	Mg^{+2} and O^{-2}	MgO
magnesium phosphide	3Mg^{+2} and 2P^{-3}	Mg_3P_2
aluminum chloride	Al^{+3} and 3Cl^{-1}	AlCl_3
aluminum oxide	2Al^{+3} and 3O^{-2}	Al_2O_3
aluminum nitride	Al^{+3} and N^{-3}	AlN

Process from Name to Chemical Formula	Process from Chemical Formula to Name						
<p>① IS it IONIC? LOOK for the name of a metal to be listed 1st.</p> <p>② S.O.S. (symbols, ox #, simplify).</p> <p>ex: Beryllium chloride</p> <p>① Beryllium is a metal, this is ionic!</p> <p>②</p> <table style="margin-left: 40px;"> <tr> <td>Be</td> <td>Cl</td> </tr> <tr> <td>Be^{+2}</td> <td>Cl^{-1}</td> </tr> <tr> <td>Be^{+2}</td> <td>2Cl^{-1}</td> </tr> </table> <p style="text-align: center;">BeCl_2</p>	Be	Cl	Be^{+2}	Cl^{-1}	Be^{+2}	2Cl^{-1}	<p>① Is it ionic? LOOK for the symbol of a metal to be listed 1st.</p> <p>② Name the metal 1st. Don't change the name.</p> <p>③ List the nonmetal 2nd, change the ending suffix to -ide.</p> <p>ex: Sr_3N_2</p> <p>① Sr is an alkaline earth metal, this is ionic!</p> <p>② Sr = Strontium N = Nitrogen</p> <p>③ Strontium nitride</p>
Be	Cl						
Be^{+2}	Cl^{-1}						
Be^{+2}	2Cl^{-1}						

Binary Ionic Compounds Practice

Elements Circle the Metal	Oxidation #'s	Lewis Structure of Compound	Balanced Formula	Name of Compound
(Ca) & Br	Ca ⁺² Br ⁻¹		CaBr ₂	calcium bromide
O & (Na)	Na ⁺¹ O ⁻²		Na ₂ O	sodium oxide
(Li) & P	Li ⁺¹ P ⁻³		Li ₃ P	lithium phosphide
S & (Al)	Al ⁺³ S ⁻²		Al ₂ S ₃	aluminum sulfide

Su

Write the formula for these compounds:

gallium chloride GaCl₃

lithium iodide LiI

beryllium oxide BeO

barium bromide BaBr₂

potassium nitride K₃N

aluminum phosphide AlP

rubidium selenide Rb₂S

magnesium nitride Mg₃N₂

Name the following compounds:

K₂O potassium oxide

NaF sodium fluoride

KI potassium iodide

Mg₃P₂ magnesium phosphide

Al₂Se₃ aluminum selenide

Rb₃N rubidium nitride

GeCl germanium chloride

GaBr₃ gallium bromide

Na₂O sodium oxide

Sr₃N₂ strontium nitride

Binary Ionic compound

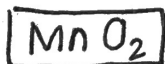
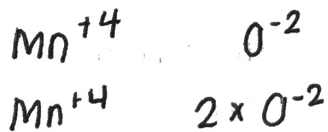
Compound Type: W/ Transition Metal

Directions: Using the table below, determine a process to go from Name to Chemical Formula, and back. Record your findings at the bottom of the page. Make sure your process is CLEAR!

Name	Formation	Chemical Formula
iron (II) oxide	Fe ⁺² and O ⁻²	FeO
iron (III) oxide	Fe ⁺³ and O ⁻²	Fe ₂ O ₃
copper (I) bromide	Cu ⁺¹ and Br ⁻¹	CuBr
copper (II) bromide	Cu ⁺² and Br ⁻¹	CuBr ₂
copper (I) oxide	Cu ⁺¹ and O ⁻²	Cu ₂ O
tin (II) sulfide	Sn ⁺² and S ⁻²	SnS
tin(IV) sulfide	Sn ⁺⁴ and S ⁻²	SnS ₂

Process from Name to Chemical Formula

- ① IS it ionic? Look for the metal to be listed first.
 - ② The roman numeral is the oxidation # of the metal.
 - ③ S.O.S.
- ex: manganese (IV) oxide
- ① Manganese is a metal, this is ionic!
 - ② (IV) means that manganese has a +4 oxidation number.
 - ③



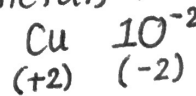
Process from Chemical Formula to Name

HONORS ONLY

- ① IS it ionic? Look for the metal to be listed first.
- ② Determine the oxidation # for the nonmetal and entire anion.
- ③ Determine the oxidation # for the entire cation, and the metal.
- ④ List the metal 1st. Add a roman numeral after the name which describes the oxidation # of the metal.
- ⑤ List the nonmetal and change the ending to -ide.

ex: CuO

- ① Cu is a metal, this is ionic!
- ②/③



Because there is only 1 Cu ion, it must be a +2 charge.

④/⑤

Copper (II) oxide

Compound Type: Ionic compound w/ polyatomic ion

Directions: Using the table below, determine a process to go from Name to Chemical Formula, and back. Record your findings at the bottom of the page. Make sure your process is CLEAR!

ammonium	NH_4^{+1}	acetate	$C_2H_3O_2^{-1}$
hydroxide	OH^{-1}	phosphate	PO_4^{-3}
carbonate	CO_3^{-2}	nitrate	NO_3^{-1}
		sulfate	SO_4^{-2}

Name	Formation	Chemical Formula
sodium nitrate	Na^{+1} and NO_3^{-1}	$NaNO_3$
magnesium nitrate	Mg^{+2} and NO_3^{-1}	$Mg(NO_3)_2$
aluminum nitrate	Al^{+3} and NO_3^{-1}	$Al(NO_3)_3$
ammonium acetate	NH_4^{+1} and $C_2H_3O_2^{-1}$	$NH_4C_2H_3O_2$
ammonium carbonate	NH_4^{+1} and CO_3^{-2}	$(NH_4)_2CO_3$
ammonium phosphate	NH_4^{+1} and PO_4^{-3}	$(NH_4)_3PO_4$

Process from Name to Chemical Formula	Process from Chemical Formula to Name				
<p>① Is it ionic? LOOK for a metal or polyatomic ion to be listed 1st.</p> <p>② S.O.S. using the polyatomic ions list as a reference.</p> <p>ex: magnesium sulfate</p> <p>① magnesium is a metal, it's ionic!</p> <p>②</p> <table border="0"> <tr> <td>Mg</td> <td>SO₄</td> </tr> <tr> <td>Mg⁺²</td> <td>SO₄⁻²</td> </tr> </table> <p><u>MgSO₄</u></p>	Mg	SO ₄	Mg ⁺²	SO ₄ ⁻²	<p>① Is it ionic? LOOK for a metal or polyatomic ion to be listed 1st.</p> <p>② List the cation 1st. Do not change the name.</p> <p>③ List the anion 2nd. If it is a polyatomic ion, do not change the name. If it isn't, then add -ide.</p> <p>ex: (NH₄)₂CO₃</p> <p>① NH₄ is a polyatomic ion - it's ionic!</p> <p>② NH₄ = ammonium CO₃ = carbonate</p> <p>③ <u>ammonium carbonate</u></p>
Mg	SO ₄				
Mg ⁺²	SO ₄ ⁻²				

Transition Metals and Polyatomic Ionic Compounds

H = Honors Only

Write the correct formula for:

- magnesium oxide MgO
- lithium bromate LiBrO₃
- titanium (IV) nitride Ti₃N₄
- aluminum sulfate Al₂(SO₄)₃
- iron (III) iodide FeI₃
- mercury (II) chlorate Hg(ClO₃)₂
- sodium sulfite Na₂SO₃
- radium bromide RaBr₂
- magnesium borate Mg₃(BO₃)₂
- vanadium(III) nitride VN

Write the correct formula for:

- iron(III) chloride FeCl₃
- copper(II) sulfate CuSO₄
- lead(II) bromide PbBr₂
- calcium iodide CaI₂
- potassium nitrate KNO₃
- tin(IV) oxide SnO₂
- manganese(III) chromate Mn₂(CrO₄)₃
- beryllium nitrite Be₃N₂
- gold(III) oxide Au₂O₃
- cobalt(II) phosphate Co₃(PO₄)₂

Write the correct name for:

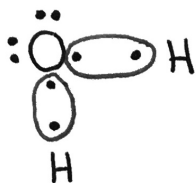
- MgS magnesium sulfide
- H 2) NiBr Nickel (I) Bromide
- 3) Ba₃N₂ Barium nitride
- 4) Al₂O₃ Aluminum oxide
- H 5) ZnS zinc (II) sulfide
- H 6) NiF₂ Nickel (II) Fluoride
- H 7) V₂S vanadium (I) sulfide
- H 8) FeCl₂ iron (II) chloride
- H 9) TiO titanium (II) oxide
- 10) AlP aluminum phosphide

Write the correct name for:

- H 11) Cu(NO₂)₂ Copper (II) nitrite
- H 12) CuBr copper (I) Bromide
- 13) GaN Gallium nitride
- H 14) Fe₂(CO₃)₃ iron (III) carbonate
- H 15) Ag(CN)₂ silver (II) cyanide
- H 16) SnO tin (II) oxide
- H 17) Cu₂S copper (I) sulfide
- 18) Mg₃(PO₃)₂ magnesium phosphite
- H 19) Zn₃N₂ zinc (II) Nitride
- H 20) Ni(IO₃)₃ Nickel (III) iodate

Covalent Bonds: Formulas, Names, Drawings

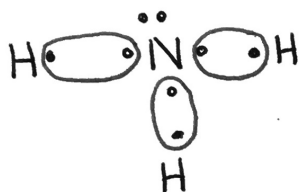
H₂O Draw Lewis dot structure with electrons being shared



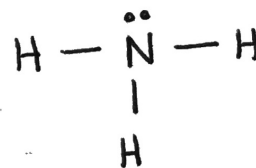
Draw molecule with bond



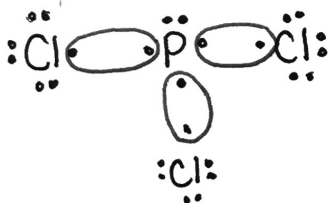
NH₃ Draw Lewis dot structure with electrons being shared



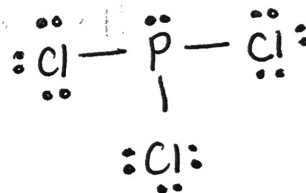
Draw molecule with bond



3. PCl₃ Draw Lewis dot structure with electrons being shared



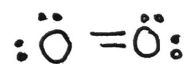
Draw molecule with bond



4. O₂ Draw Lewis dot structure with electrons being shared



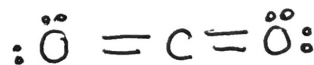
Draw molecule with bond



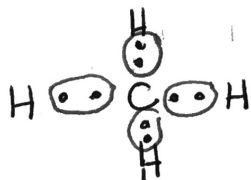
5. CO₂ Draw Lewis dot structure with electrons being shared



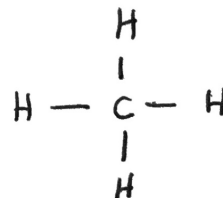
Draw molecule with bond



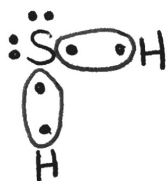
6. CH₄ Draw Lewis dot structure with electrons being shared



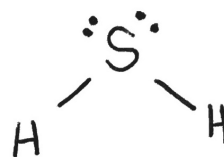
Draw molecule with bond



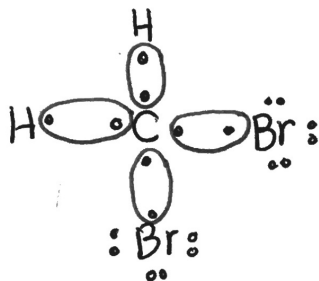
7. H₂S Draw Lewis dot structure with electrons being shared



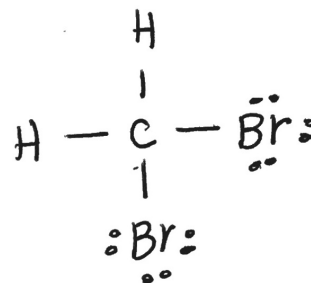
Draw molecule with bond



8. CH₂Br₂ Draw Lewis dot structure with electrons being shared



Draw molecule with bond



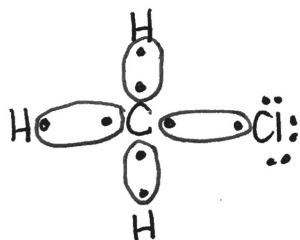
9. HCN Draw Lewis dot structure with electrons being shared



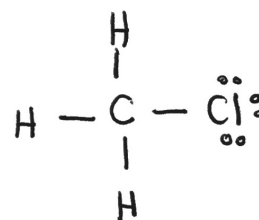
Draw molecule with bond



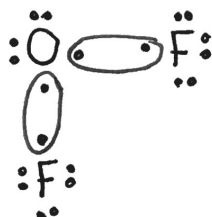
10. CH₃Cl Draw Lewis dot structure with electrons being shared



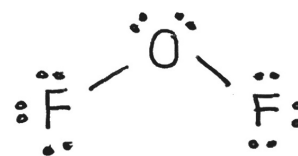
Draw molecule with bond



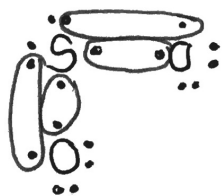
11. OF₂ Draw Lewis dot structure with electrons being shared



Draw molecule with bond

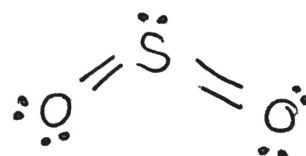


12. SO₂ Draw Lewis dot structure with electrons being shared



Draw molecule with bond

* EXCEPTION
to the octet rule



Binary Covalent Compound Type: molecules

Directions: Using the table below, determine a process to go from Name to Chemical Formula, and back. Record your findings at the bottom of the page. Make sure your process is CLEAR!

Name	Chemical Formula
Carbon Monoxide	CO
Dihydrogen monoxide	H ₂ O
Trinitrogen dichloride	N ₃ Cl ₂
Tetraphosphorous decaoxide	P ₄ O ₁₀
Hexanitrogen pentafluoride	N ₆ F ₅
Heptahydrogen octasulfide	H ₇ S ₈
Nonanitrogen trioxide	N ₉ O ₃

Process from Name to Chemical Formula	Process from Chemical Formula to Name
<p>① is it covalent? Check that BOTH elements are nonmetals</p> <p>② The prefix represents how many of that element appear in the chemical formula.</p> <p>* If there is no prefix on the 1st element, there is only 1.</p> <p>* Listed in order of increasing electronegativity, whatever has the -ide ending is listed 2nd.</p> <p>mono - 1 hexa - 6 di - 2 hepta - 7 tri - 3 octa - 8 tetra - 4 nona - 9 penta - 5 deca - 10</p> <p>ex: Nitrogen dioxide</p> <p>① N and O are nonmetals, it's a covalent molecule.</p> <p>② 1N 2O (di oxide)</p> <p style="text-align: center;">NO₂</p>	<p>① is it covalent? Check that BOTH elements are nonmetals.</p> <p>② whatever element is first in the formula is first in the name. Add an appropriate prefix, if any. DO NOT change the ending.</p> <p>③ whatever element is second gets listed 2nd. Add a prefix and change the ending to -ide.</p> <p>ex: CO₂</p> <p>① C and O are nonmetals - it's covalent!</p> <p>② 1C 2O</p> <p style="text-align: center;">↓</p> <p>listed 1st, no prefix because there is only 1 carbon in formula.</p> <p>③ 1C 2O</p> <p style="text-align: center;">↓</p> <p>listed 2nd as <u>dioxide</u></p> <p style="text-align: center;">Carbon dioxide</p>

Covalent Molecules Names and Formulas

Write the name of each of the given molecules:

1. SF₆

1. Sulfur hexafluoride

2. P₂Br₈

2. diphosphorous octabromide

3. SiF₃

3. Silicon trifluoride

4. N₂O

4. dinitrogen monoxide

5. P₄O₁₀

5. tetraphosphorous decaoxide

6. N₂O₅

6. dinitrogen pentaoxide

7. SO₂

7. Sulfur dioxide

8. CBr₄

8. Carbon tetrabromide

Write the chemical formula for each of the given names:

9. nitrogen triiodide

9. NI₃

10. dinitrogen tetroxide

10. N₂O₄

11. boron tetrahydride

11. BH₄

12. carbon monoxide

12. CO

13. dihydrogen monoxide

13. H₂O

14. tricarbon hexiodide

14. C₃I₆

15. phosphorus trichloride

15. PCl₃

16. diphosphorous heptoxide

16. P₂O₇

Compound Type: Hydrocarbons - Alkanes

Directions: Using the table below, determine a process to go from Name to Chemical Formula, and back. Record your findings at the bottom of the page. Make sure your process is CLEAR!

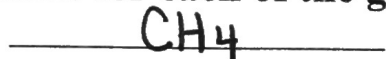
Name	Formulas
Methane	CH ₄
Ethane	C ₂ H ₆
Propane	C ₃ H ₈
Butane	C ₄ H ₁₀
Pentane	C ₅ H ₁₂
Hexane	C ₆ H ₁₄

Process from Name to Chemical Formula	Process from Chemical Formula to Name										
<p>① IS it a hydrocarbon? It will contain <u>ONLY</u> hydrogen and carbon and will end in -ane.</p> <p>② The prefix tells you the # of carbons in the chemical formula.</p> <table style="margin-left: 20px;"> <tr> <td>meth - 1</td> <td>hex - 6</td> </tr> <tr> <td>eth - 2</td> <td>hept - 7</td> </tr> <tr> <td>prop - 3</td> <td>oct - 8</td> </tr> <tr> <td>but - 4</td> <td>non - 9</td> </tr> <tr> <td>pent - 5</td> <td>dec - 10</td> </tr> </table> <p>③ If we assume all of the carbons have single bonds between them, the amount of hydrogen atoms will be equal to the amount to surround each carbon with a full octet - or C_nH_(2n+2).</p> <p>ex: methane C₁H_(2x1+2) = CH₄</p> <p>ex: propane</p> <div style="margin-left: 40px;"> $\begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array}$ <p style="margin-left: 100px;">C₃H_(2x3+2)</p> <p style="margin-left: 100px;">C₃H₈</p> </div>	meth - 1	hex - 6	eth - 2	hept - 7	prop - 3	oct - 8	but - 4	non - 9	pent - 5	dec - 10	<p>① IS it a hydrocarbon? It will <u>only</u> contain hydrogen and carbon and they will be in the C_nH_(2n+2) ratio.</p> <p>② Choose the appropriate prefix to represent the number of carbons.</p> <p style="margin-left: 20px;">Add the ending of -ane to show that those carbons are all single-bonded to one another.</p> <p>ex: C₆H₁₄</p> <p>① It's a hydrocarbon - it contains only C and H.</p> <p>It's an alkane - it has C_nH_(2n+2) ratio</p> <p>②</p> <div style="margin-left: 40px;"> <p>C₆H₁₄</p> <p style="margin-left: 20px;">↓</p> <p style="margin-left: 20px;">hexane → Structural formula</p> <div style="margin-left: 40px;"> $\begin{array}{cccccccc} & \text{H} & & \text{H} & & \text{H} & & \text{H} \\ & & & & & & & \\ \text{H} & -\text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\ & & & & & & & \\ & \text{H} & & \text{H} & & \text{H} & & \text{H} \end{array}$ <p style="margin-left: 100px;">Alkane = straight chain</p> </div> </div>
meth - 1	hex - 6										
eth - 2	hept - 7										
prop - 3	oct - 8										
but - 4	non - 9										
pent - 5	dec - 10										

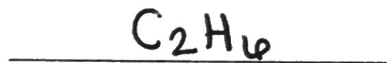
formula

Write the chemical ~~name~~ for each of the given the hydrocarbons:

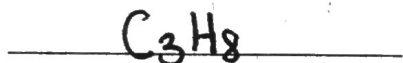
Methane



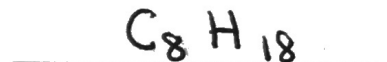
Ethane



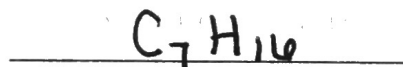
Propane



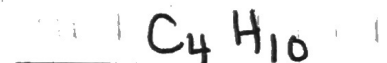
Octane



Heptane



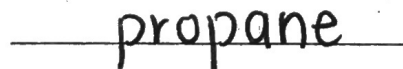
Butane



Name

Write the chemical ~~formula~~ for each of the given hydrocarbons:

C₃H₈



C₉H₂₀



C₆H₁₄



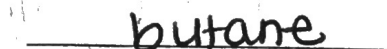
C₁₀H₂₂



C₂H₆

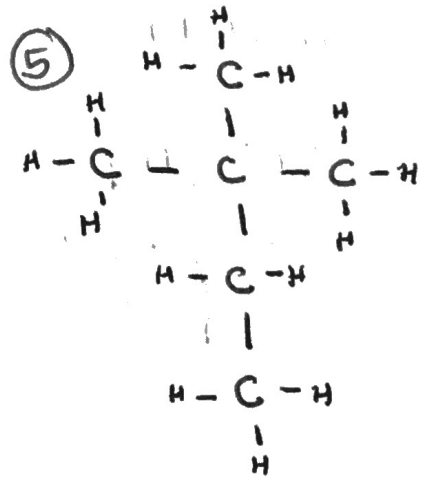
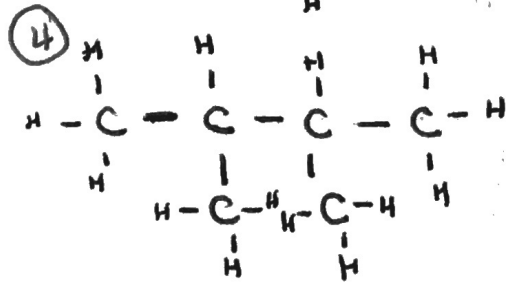
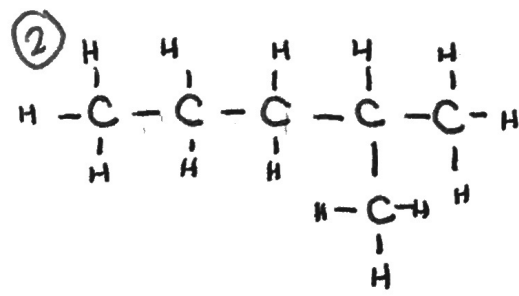
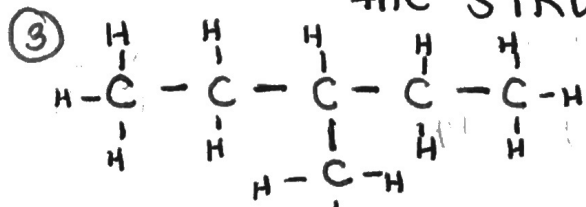
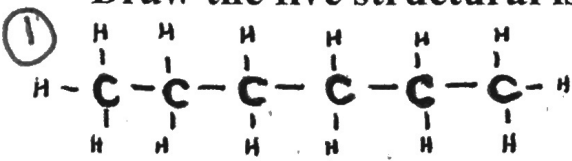


C₄H₁₀



Draw the five structural isomers of hexane:

Formula must be C₆H₁₄, but the STRUCTURE must change!



d Compounds Review: Naming and Formulas

the following chemical compounds:

Write the formulas for the following chemical

C_3P tri carbon monophosphide compounds:

- | | | | | |
|-------------------|--------------------------------|-----|--------------------------|--------------------------------|
| $Ca(C_2H_3O_2)_2$ | <u>calcium acetate</u> | 13) | silicon dioxide | <u>SiO_2</u> |
| P_2O_5 | <u>diphosphorous pentoxide</u> | 14) | barium sulfite | <u>$BaSO_3$</u> |
| K_2SO_3 | <u>potassium sulfite</u> | 15) | manganese (II) phosphide | <u>Mn_3P_2</u> |
| $FePO_4$ | <u>iron (III) phosphate</u> | 16) | propane | <u>C_3H_8</u> |
| C_2H_6 | <u>ethane</u> | 17) | diboron tetrabromide | <u>B_2Br_4</u> |
| $Al_2(CO_3)_3$ | <u>aluminum carbonate</u> | 18) | lead (II) nitrate | <u>$Pb(NO_3)_2$</u> |
| $ZnSO_4$ | <u>zinc (II) sulfate</u> | 19) | ammonium fluoride | <u>$(NH_4)F$</u> |
| $(NH_4)_3P$ | <u>ammonium phosphide</u> | 20) | triboron hexoxide | <u>B_3O_6</u> |
| $CuOH$ | <u>copper (I) hydroxide</u> | 21) | heptane | <u>C_7H_{16}</u> |
| C_5H_{12} | <u>pentane</u> | 22) | chromium (III) hydroxide | <u>$Cr(OH)_3$</u> |
| SO_2 | <u>sulfur dioxide</u> | 23) | tin (IV) selenide | <u>$SnSe_2$</u> |
| | | 24) | carbon tetrachloride | <u>CCl_4</u> |

Compound Type: Acids

Directions: Using the table below, determine a process to go from Name to Chemical Formula, and back. Record your findings at the bottom of the page. Make sure your process is CLEAR!

ammonium	NH_4^{+1}	acetate	$\text{C}_2\text{H}_3\text{O}_2^{-1}$
hydroxide	OH^{-1}	phosphate	PO_4^{-3}
carbonate	CO_3^{-2}	nitrate	NO_3^{-1}
		sulfate	SO_4^{-2}

Name	Formation	Chemical Formula
Hydrochloric Acid	H^{+1} and Cl^{-1}	HCl
Hydrobromic Acid	H^{+1} and Br^{-1}	HBr
Hydrofluoric Acid	H^{+1} and F^{-1}	HF
Acetic Acid	H^{+1} and $\text{C}_2\text{H}_3\text{O}_2^{-1}$	$\text{HC}_2\text{H}_3\text{O}_2$
Nitric Acid	H^{+1} and NO_3^{-1} <i>Nitrate</i>	HNO_3
Phosphoric Acid	H^{+1} and PO_4^{-3}	H_3PO_4
Carbonic Acid	H^{+1} and CO_3^{-2}	H_2CO_3
Nitrous Acid	H^{+1} and NO_2^{-1} <i>Nitrite</i>	HNO_2
Phosphorous Acid	H^{+1} and PO_3^{-3}	H_3PO_3
Sulfurous Acid	H^{+1} and SO_3^{-2}	H_2SO_3

Binary

Oxyacids

Anion names ending in -ate

Anion names ending in -ite

Process from Name to Chemical Formula	Process from Chemical Formula to Name
<p>① IS it an acid? The 2nd word will be "acid" if it is!</p> <p>② IS it a <u>Binary</u> or <u>oxyacid</u>? If the name has "hydro" as a prefix, it is binary.</p> <p>③ Hydrogen will be the cation. Identify the anion anion then <u>S.O.S.</u></p> <p>* <u>Binary</u>: the anion anion will be the root of the name. ex: hydro<u>fluoric</u> acid Fluorine is the anion. S.O.S. $\text{H}^{+1} \text{F}^{-1} \rightarrow \text{HF}$</p> <p>* <u>Oxyacids</u>: if it ends in -ic, the anion is a polyatomic ending in -ate. if it ends in -ous, the anion is a polyatomic ending in -ite.</p>	<p>① IS it an acid? It will begin with hydrogen if it is!</p> <p>② IS it a <u>Binary</u> or <u>oxyacid</u>? It will be binary if only 2 elements are present.</p> <p>③ <u>Binary</u>: Add hydro- as the prefix, then the root of the anion. Add -ic as the suffix, then "acid" ex: $\text{HCl} = \text{hydrochloric acid}$</p> <p><u>oxyacid</u>: Identify the anion. * if it ends in -ate, change the ending to -ic, then "acid" ex: $\text{HNO}_3 = \text{Nitric acid}$</p> <p>* if it ends in -ite, change the ending to -ous, add "acid" ex: $\text{HNO}_2 = \text{Nitrous acid}$</p>

Acids Names and Formulas Practice

1. Nitric acid



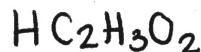
2. Hydrosulfuric acid



3. Chloric acid



4. Acetic acid



5. Hydrobromic acid



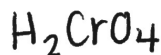
6. Sulfurous acid



7. Chlorous acid



8. Chromic Acid



9. Hydrochloric acid



10. Phosphoric acid



11. Nitrous acid



12. Hydrofluoric acid



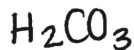
13. Hydroiodic acid



14. Phosphorous acid



15. Carbonic acid



Write the correct name for the following acids:

16. HClO₄

perchloric acid

17. HC₂H₃O₂

acetic acid

18. H₃PO₄

phosphoric acid

19. HCl

hydrochloric acid

20. H₂SO₄

sulfuric acid

21. HNO₂

nitrous acid

22. HI

hydroiodic acid

23. HF

hydrofluoric acid

24. H₃PO₃

phosphorous acid

25. HClO₃

chloric acid

Unit 5 Review: Naming and Bonding

1. What is the term for the number of valence electrons gained or lost during bonding?

Oxidation #

2. How do you use the periodic table to determine the number of valence electrons?

The main group elements have 1-8, starting with the Alkali metals (group 1) and ending with noble gases (group 18)

3. Describe the characteristics of an ionic compound:

- Solid at room temp.
- Brittle
- Dissolve in water
- Conduct electricity
- High melting/boiling points

4. Describe the characteristics of a covalent compound:

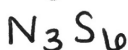
- liquid/gaseous at room temp.
- DO NOT dissolve in water
- DO NOT conduct electricity
- Low melting/boiling points

5. Write the formula for the following compounds:

A) Potassium Nitrate



B) Trinitrogen Hexasulfide



C) Gold (III) Phosphide



D) Nitrous Acid



6. Name these compounds:

A) C_4Br_2

tetracarbon
dibromide

B) Li_3PO_4

lithium
phosphate

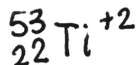
C) H_3P

hydrophosphonic
acid

D) $\text{Fe}(\text{NO}_2)_2$

iron (II)
nitrite

7. An atom has 22 protons and a mass number of 53, and has a 2+ charge. Write this element in isotopic notation.



8. What does the Roman numeral represent in a chemical compound?

The oxidation # of the metal

9. Where are the metals found on the periodic table?

To the left of the staircase (groups 1-12 for the most part)

10. What is a structural isomer?

A set of molecules with the same formula, but different structure.

11. Where are the transition metals located?

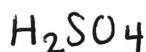
Groups 3-12

12. What element do all acids start with?

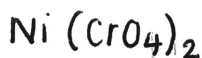
Hydrogen

13. Write the formula for these compounds:

A) Sulfuric Acid



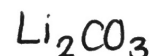
B) Nickel (IV) Chromate



C) Sulfur Trioxide



D) Lithium Carbonate



14. Isotopes are forms of the same element, but with different number of neutrons.

15. If you see a compound's name that has prefixes at the beginning, then what type of bonding will it be?

covalent!

16. List the prefixes for covalent compounds 1-10:

1 mono	4 tetra	7 hepta
2 di	5 penta	8 octa
3 tri	6 hexa	9 nona
		10 deca

17. Name the following Compounds:

A) HF hydrofluoric acid	B) Mn_2O manganese(I) oxide	C) B_2O_7 diboron heptaoxide	D) H_2SO_3 sulfurous acid	E) Ca_2N_3 calcium nitride
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18. Which way do periods on the periodic table go? What does the period number indicate?

Left to right, the # of energy levels

19. Which way do groups go on the periodic table? What does the group number indicate?

Top to bottom, the # of valence e^-

20. Write these formulas:

A) Hydrophosphoric Acid H_3P	B) Carbonic Acid H_2CO_3	C) Sulfur Heptabromide SBr_7	D) Zinc (IV) Manganate $Zn(MnO_4)_2$
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21. The sum of the oxidation numbers in an ionic compound will always equal zero!

Answer the following questions for the formula $Ca_3(PO_4)_2$

23. What type of compound is this? Justify your response: ionic, it contains a metal (Ca) and polyatomic ion (PO_4) as an anion.

24. How many elements are in the above compound? 3 - Ca, P, O

25. How many total atoms are in the bond? 13.

26. Write the oxidation number for the metal in each of the following compounds:

A) ZnO Zn +2	B) $FePO_4$ Fe +3	C) CoF_2 Co +2	D) $Mn(SO_4)_2$ Mn +4	E) FeN Fe +3
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27. Write the oxidation number for the following elements:

A) Bromine -1	B) Calcium +2	C) Indium +3	D) Phosphorus -3	E) Iodine WT -1
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28. Name and Write the following for the compounds below

A) $Ba(CN)_2$ Barium cyanide

B) Ammonium Hydroxide NH_4OH

C) P_3O triphosphorus monoxide

D) Zinc (II) Sulfide ZnS

E) Hg_3N mercury (I) nitride

F) Pentanitrogen Heptaoxide N_5O_7

G) H_2CO_3 carbonic acid

H) Hydrophosphoric Acid H_3P