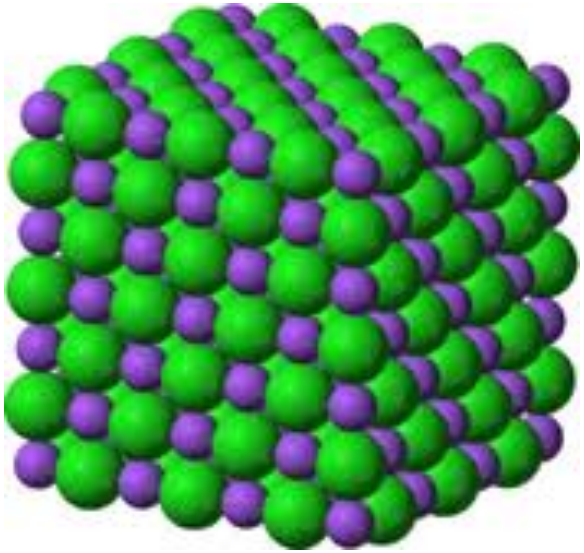
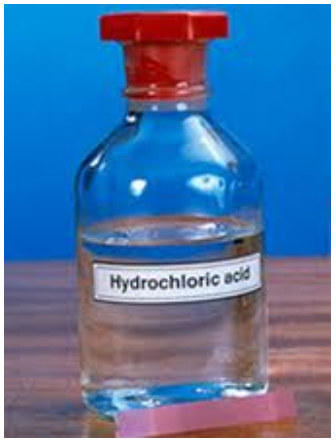
Nomenclature:

1. Rules for naming covalent-molecular compounds



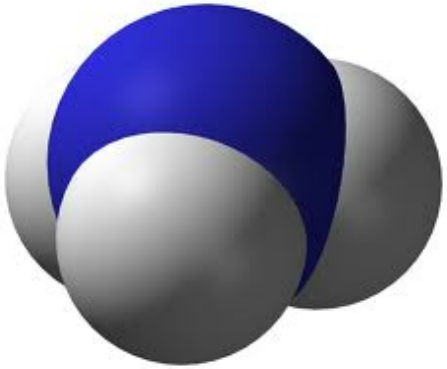
2. Rules for naming ionic compounds



3. Rules for naming acids (Chapter 4)

Using only the formula, determine if it is covalent-molecular or ionic.

Do you see only non-metals, and no familiar ions? If so, it's covalent-molecular.



SO_2

CO_2

NCl_3

NO

SCl_4

K_2S

NH_4NO_3

N_2O_5

NO_3

PCl_5

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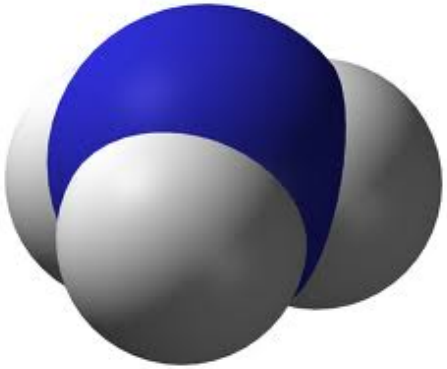


SO_2 covalent-molecular

CO_2 covalent-molecular

NCl_3 covalent-molecular

NO covalent-molecular

SCl_4 covalent-molecular

K_2S ionic

NH_4NO_3 ionic

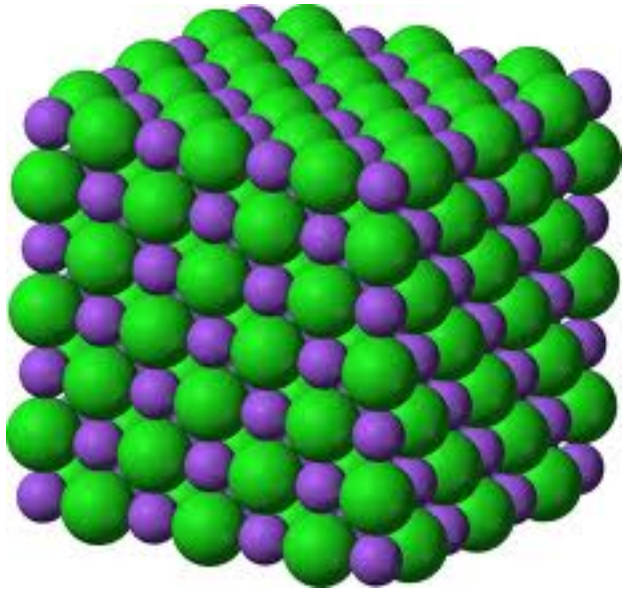
N_2O_5 covalent-molecular

NO_3 covalent-molecular

PCl_5 covalent-molecular

Is it ionic?

1. Do you see familiar polyatomic ions?
2. Does the formula contain a metal cation and a non-metal anion?



$MnSO_4$

K_2O_2

$NiCl_2$

$CuCO_3$

$SeCl_2$

K_2CrO_4

$(NH_4)_2SO_3$

NO_2

SO_3

$AgClO_4$

Is it ionic?

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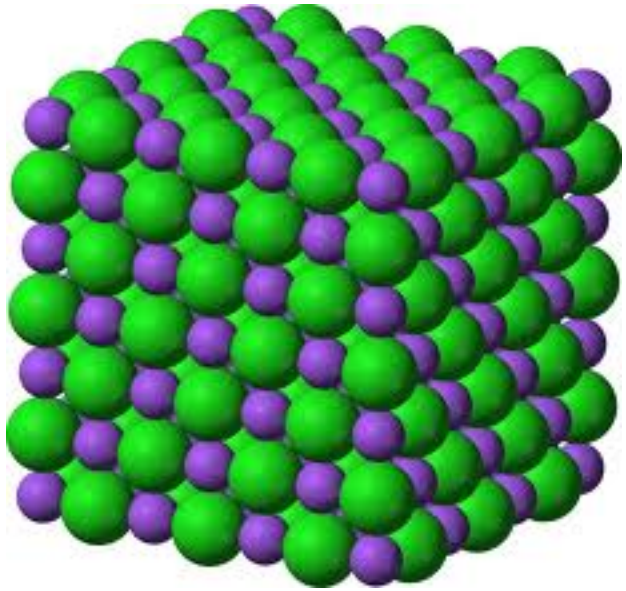
2. Does the formula contain a metal cation and a non-metal anion?



$MnSO_4$ ionic

K_2O_2 ionic

$NiCl_2$ ionic

$CuCO_3$ ionic

$SeCl_2$ covalent-molecular

K_2CrO_4 ionic

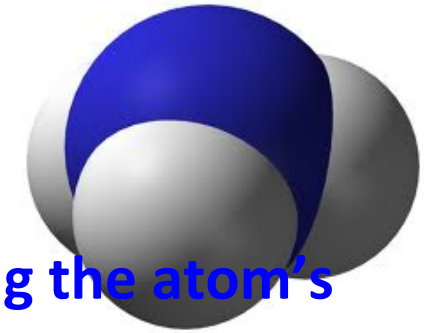
$(NH_4)_2SO_3$ ionic

NO_2 covalent-molecular

SO_3 covalent-molecular

$AgClO_4$ ionic

Naming covalent-moleculars:



1. Name the central atom first using the atom's name.
2. Name the other atoms next, using –ide endings.
3. Use prefixes (mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, etc.) to indicate number of each atom. Do not use mono- with first atom.

SO_2

CO_2

NCl_3

NO

SCl_4

Cl_2O_7

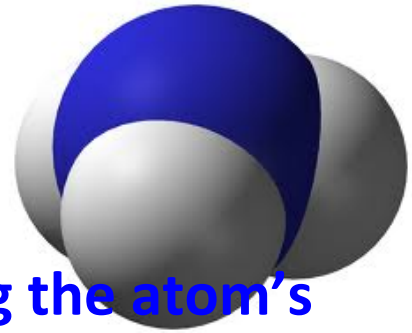
P_4S_6

N_2O_5

NO_3

PCl_5

Naming covalent-moleculars:



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SO_2 sulfur dioxide

CO_2 carbon dioxide

NCl_3 nitrogen trichloride

NO nitrogen monoxide

SCl_4 sulfur tetrachloride

Cl_2O_7 dichlorine heptoxide

P_4S_6 tetraphosphorus hexasulfide

N_2O_5 dinitrogen pentoxide

NO_3 nitrogen trioxide

PCl_5 phosphorus pentachloride

Ionics… some helpful generalizations

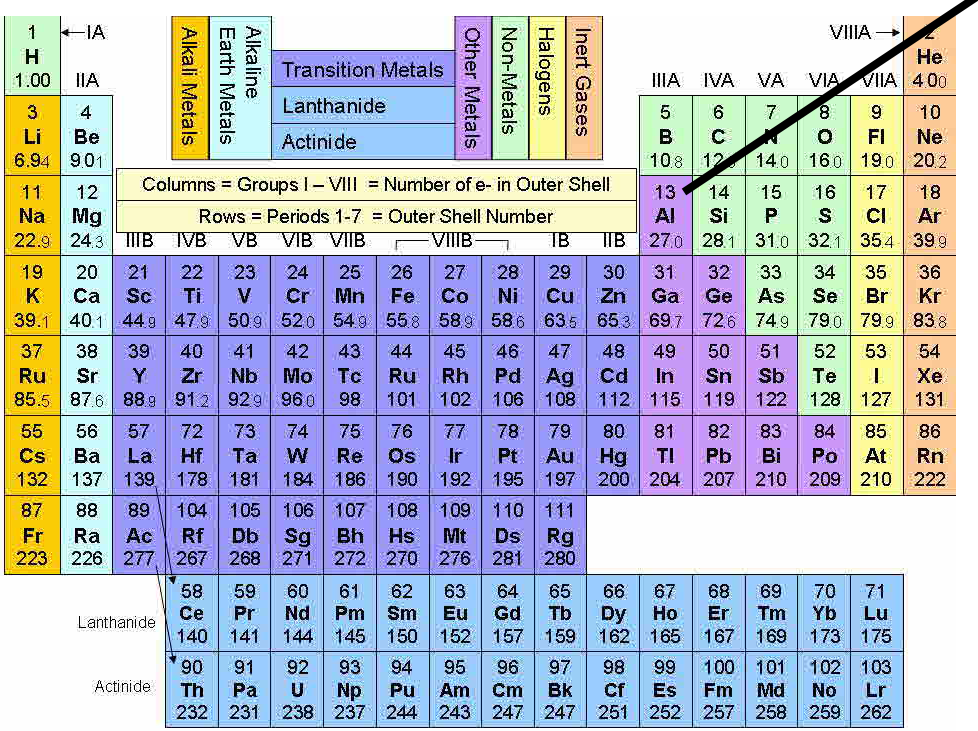
1. From the periodic table:

Alkali metals like to form +1 cations in their ionic compounds.

Alkaline earth metals form +2 ions

Aluminum forms +3 ions

Al forms Al^{3+}



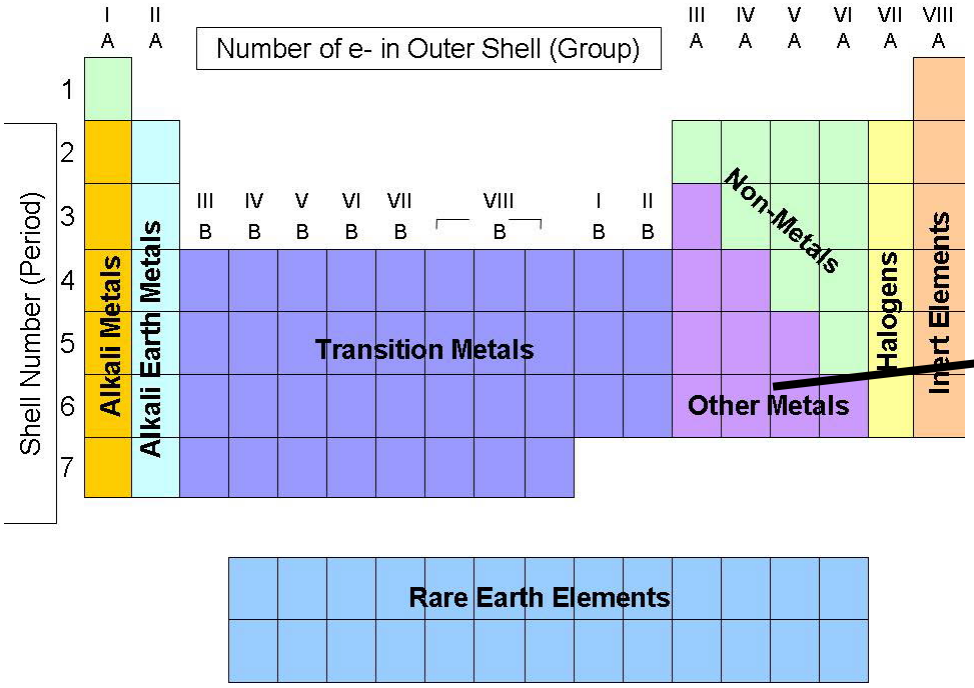
Li^+ Na^+ K^+ Rb^+ Cs^+

Be^{2+} Mg^{2+} Ca^{2+} Sr^{2+} Ba^{2+}

Ionics… some helpful generalizations

2. Transition metals and post-transition metals form a variety of cations, but not anions.

Ti^{2+} Ti^{3+} Ti^{4+} V^{2+} V^{3+} V^{4+} V^{5+} Cr^{2+} Cr^{3+} Mn^{2+} Mn^{3+} Fe^{2+} Fe^{3+} Co^{2+} Co^{3+}
Ni^{2+} Ni^{3+} Cu^{+} Cu^{2+} Zn^{2+} Ag^{+} Cd^{2+} Hg_2^{2+} Hg^{2+} Sn^{2+} Sn^{4+} Pb^{2+} Pb^{4+} Ga^{3+} In^{3+}



"other metals" are the post-transition metals

Ionics… some helpful generalizations

3. Cations made from metals carry the name of the metallic element.
4. Transition elements give the charge as part of their name as a Roman numeral in parentheses.

Na^+ sodium ion

Cu^{2+} copper(II) ion

Ionics… some helpful generalizations

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Na^{+} sodium ion

Cu^{2+} copper(II) ion

V^{+5}

Mg^{+2}

Co^{+3}

Ag^{+}

Rb^{+}

Ionics… some helpful generalizations

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Na^{+} sodium ion

Cu^{2+} copper(II) ion

V^{+5} vanadium(V) ion

Mg^{+2} magnesium ion

Co^{+3} cobalt(III) ion

Ag^{+} silver(I) ion

Rb^{+} rubidium ion

Ionics… some helpful generalizations

5. Polyatomic cations have names to be memorized: NH_4^+ is ammonium.
6. Anions of a single type of atom carry an –ide ending: Cl is chlorine; Cl^- is chloride.
7. Polyatomic anions have names that end in –ite or –ate, but very seldom –ide.
8. Anions with –ate endings have one more oxygen atom than anions with –ite endings.

S^{2-} sulfide SO_3^{2-} sulfite SO_4^{2-} sulfate

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S^{2-}	sulfide	SO_3^{2-}	sulfite	SO_4^{2-}	sulfate
N^{3-}		NO_2^-		NO_3^-	
P^{3-}		PO_3^{3-}		PO_4^{3-}	
Cl^-		ClO_2^-		ClO_3^-	

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S^{2-}	sulfide	SO_3^{2-}	sulfite	SO_4^{2-}	sulfate
N^{3-}	nitride	NO_2^-	nitrite	NO_3^-	nitrate
P^{3-}	phosphide	PO_3^{3-}	phosphite	PO_4^{3-}	phosphate
Cl^-	chloride	ClO_2^-	chlorite	ClO_3^-	chlorate

Ionics… some helpful generalizations

9. The halogens form a series of five anions!

Cl^-

ClO^-

ClO_2^-

ClO_3^-

ClO_4^-

Ionics… some helpful generalizations

9. The halogens form a series of five anions!

Cl^-	chloride
ClO^-	
ClO_2^-	chlorite
ClO_3^-	chlorate
ClO_4^-	

Ionics… some helpful generalizations

9. The halogens form a series of five anions!

Cl^-	chloride
ClO^-	hypohlorite
ClO_2^-	chlorite
ClO_3^-	chlorate
ClO_4^-	

Ionics… some helpful generalizations

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Cl^-	chloride
ClO^-	hypohlorite
ClO_2^-	chlorite
ClO_3^-	chlorate
ClO_4^-	perchlorate

Ionics… some helpful generalizations

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Cl^-	chloride	Br^-
ClO^-	hypochlorite	BrO^-
ClO_2^-	chlorite	BrO_2^-
ClO_3^-	chlorate	BrO_3^-
ClO_4^-	perchlorate	BrO_4^-

Ionics… some helpful generalizations

9. The halogens form a series of five anions!

Cl^-	chloride	Br^-	bromide
ClO^-	hypochlorite	BrO^-	hypobromite
ClO_2^-	chlorite	BrO_2^-	bromite
ClO_3^-	chlorate	BrO_3^-	bromate
ClO_4^-	perchlorate	BrO_4^-	perbromate

Ionics… some helpful generalizations

9. The halogens form a series of five anions!

Cl^-	chloride	I^-
ClO^-	hypochlorite	IO^-
ClO_2^-	chlorite	IO_2^-
ClO_3^-	chlorate	IO_3^-
ClO_4^-	perchlorate	IO_4^-

Ionics… some helpful generalizations

9. The halogens form a series of five anions!

Cl^-	chloride	I^-	iodide
ClO^-	hypochlorite	IO^-	hypoiodite
ClO_2^-	chlorite	IO_2^-	iodite
ClO_3^-	chlorate	IO_3^-	iodate
ClO_4^-	perchlorate	IO_4^-	periodate

Rules for Naming Ionics

1. Name cation first, then anion. Remember transition metals need () with charge!
2. Only use parentheses with polyatomic ions, and then only when there are two or more in formula.
3. Do not use capital letters when naming compounds.

$NaClO_3$

$Ca(OH)_2$

CoI_3

$(NH_4)_2CO_3$

$K_2Cr_2O_7$

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1. Name cation first, then anion. Remember transition metals need () with charge!
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3. Do not use capital letters when naming compounds.

$NaClO_3$	sodium chlorate
$Ca(OH)_2$	calcium hydroxide
CoI_3	cobalt(III) iodide
$(NH_4)_2CO_3$	ammonium carbonate
$K_2Cr_2O_7$	potassium dichromate

Rules for Naming Ionics

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potassium permanganate

beryllium cyanide

iron(II) nitrate or ferrous nitrate

lithium bicarbonate / lithium hydrogen carbonate

silver(I) perchlorate

Rules for Naming Ionics

1. Name cation first, then anion. Remember transition metals need () with charge!
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3. Do not use capital letters when naming compounds.

$KMnO_4$	potassium permanganate
$Be(CN)_2$	beryllium cyanide
$Fe(NO_3)_2$	iron(II) nitrate or ferrous nitrate
$LiHCO_3$	lithium bicarbonate / lithium hydrogen carbonate
$AgClO_4$	silver(I) perchlorate

More Ionics

KH_2PO_4

$MgHPO_4$

$FeSO_4$

Hg_2Cl_2

$Cu(BrO_2)_2$

manganese(III) phosphate

calcium thiocyanate

lead(II) nitrate

mercuric chlorate

aluminum hypoiodite

More Ionics

KH_2PO_4	potassium dihydrogen phosphate
$MgHPO_4$	magnesium hydrogen phosphate
$FeSO_4$	ferrous sulfate or iron(II) sulfate
Hg_2Cl_2	mercurous chloride or mercury(I) chloride
$Cu(BrO_2)_2$	cupric bromite
$MnPO_4$	manganese(III) phosphate
$Ca(SCN)_2$	calcium thiocyanate
$Pb(NO_3)_2$	lead(II) nitrate
$Hg(ClO_3)_2$	mercuric chlorate
$Al(IO)_3$	aluminum hypoiodite

Ionics mixed with covalent-moleculars

NH_4SCN

AsI_3

$CuNO_2$

H_2S

$Zn(C_2H_3O_2)_2$

calcium phosphate

chromium(III) chromate

lead(IV) bromide

nitrogen trioxide

selenium dioxide

Ionics mixed with covalent-moleculars

NH_4SCN	ammonium thiocyanate
AsI_3	arsenic triiodide
$CuNO_2$	cuprous nitrite or copper(I) nitrite
H_2S	dihydrogen sulfide
$Zn(C_2H_3O_2)_2$	zinc(II) acetate
$Ca_3(PO_4)_2$	calcium phosphate
$Cr_2(CrO_4)_3$	chromium(III) chromate
$PbBr_4$	lead(IV) bromide
NO_3	nitrogen trioxide
SeO_2	selenium dioxide

At the course website, you can download:

1. An extensive worksheet where you can practice by naming 40 ionic compounds, 40 covalent moleculars, and 40 acids. Answer key also posted.
2. Use this as a dress rehearsal when you think you are ready. You can miss only 3 to pass.
3. This Powerpoint presentation

Nomenclature Certification Quiz coming Friday, 6 September 2019. Periodic table provided.