

# Chemical Nomenclature



# Nomenclature: Identify Elements as...

*Periodic Table*

1A 1 H 1.008																	8A 2 He 4.003	
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18	
11 Na 23.00	12 Mg 24.31	3B	4B	5B	6B	7B	8B				1B	2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80	
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3	
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)	
87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Ha (262)	106 Unh (263)	107 Uns (262)			109 Une (267)									

Nonmetals  
(yellow)

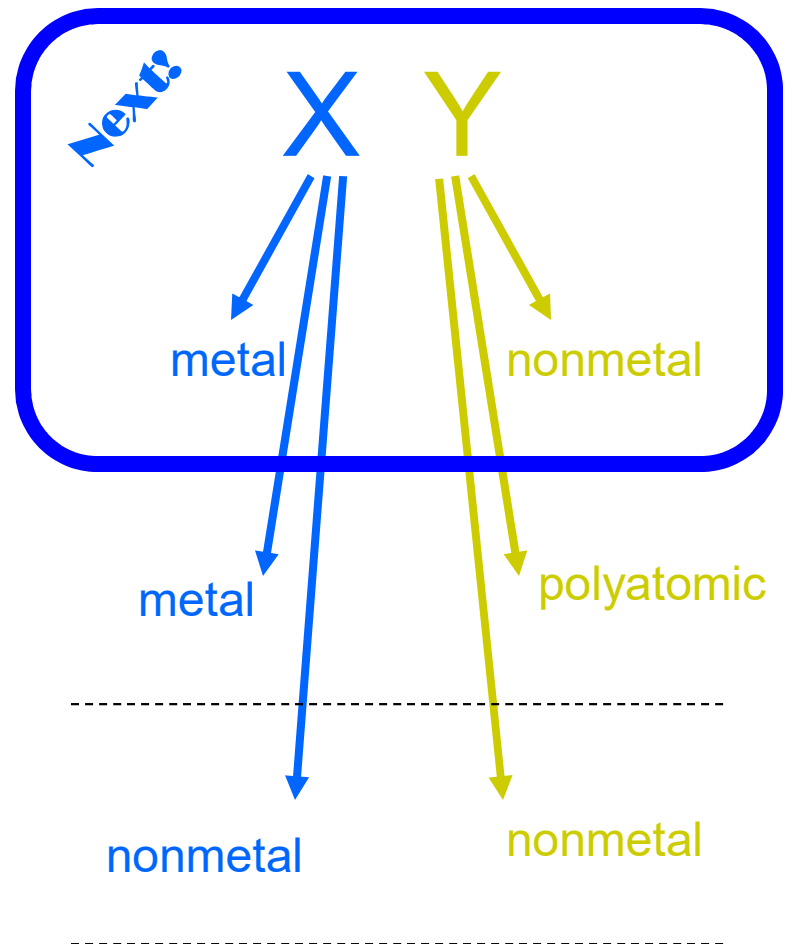
Metals (blue)

Metalloids (Pink)



# Nomenclature: ID type of compound

- Identify elements as metals, nonmetals, polyatomic ions or semimetals
- Apply nomenclature for each category:
  - Metal – nonmetal
  - Metal – polyatomic
  - Nonmetal – nonmetal



# Nomenclature: Example

## *Metal – Nonmetal (a.k.a. ionic)*

*Periodic Table*

1A 1 H 1.008	2A 2 He 4.003											3A 3 B 10.81	4A 4 C 12.01	5A 5 N 14.01	6A 6 O 16.00	7A 7 F 19.00	8A 8 Ne 20.18				
11 Na 23.00	12 Mg 24.31	3B 3 Sc 44.96	4B 4 Ti 47.90	5B 5 V 50.94	6B 6 Cr 52.00	7B 7 Mn 54.94	8B 8 Fe 55.85					9 Co 58.93	10 Ni 58.70	11 Cu 63.55	12 Zn 65.38	13 Ga 69.72	14 Ge 72.59	15 As 74.92	16 Se 78.96	17 Br 79.90	18 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	(98) 43 Tc 101.1	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3				
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)				
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Ha (262)	106 Unh (263)	107 Uns (262)	109 Uue (267)														

Na Cl

X

Y

metal

nonmetal

Sodium

~~Chlorine~~

+ ide

Sodium

Chloride

Write down, in order the names of the two elements. Drop the ending of the second element and add "ide".

Answer: Sodium Chloride





# Nomenclature: Backwards

## Metal - Nonmetal (a.k.a. ionic)

Iron (III) fluoride  
 X Y

Periodic Table

1A 1 H 1.008	2A 3 Li 6.941	3B 4 Be 9.012	5B 11 Na 23.002	6B 12 Mg 24.31	7B 19 K 39.10	8B 20 Ca 40.08	9B 21 Sc 44.96	10B 22 Ti 47.90	11B 23 V 50.94	12B 24 Cr 52.00	13B 25 Mn 54.94	14B 26 Fe 55.85	15B 27 Co 58.93	16B 28 Ni 58.70	17B 29 Cu 63.55	18B 30 Zn 65.38	19B 31 Ga 69.72	20B 32 Ge 72.59	21B 33 As 74.92	22B 34 Se 78.96	23B 35 Br 79.90	24B 36 Kr 83.80	25B 37 Rb 85.47	26B 38 Sr 87.62	27B 39 Y 88.91	28B 40 Zr 91.22	29B 41 Nb 92.91	30B 42 Mo 95.94	(98) 43 Tc 101.1	31B 44 Ru 101.1	32B 45 Rh 102.9	33B 46 Pd 106.4	34B 47 Ag 107.9	35B 48 Cd 112.4	36B 49 In 114.8	37B 50 Sn 118.7	38B 51 Sb 121.8	39B 52 Te 127.6	40B 53 I 126.9	41B 54 Xe 131.3	42B 55 Cs 132.9	43B 56 Ba 137.3	44B 57 La 138.9	45B 72 Hf 178.5	46B 73 Ta 180.9	47B 74 W 183.9	48B 75 Re 186.2	49B 76 Os 190.2	50B 77 Ir 192.2	51B 78 Pt 195.1	52B 79 Au 197.0	53B 80 Hg 200.6	54B 81 Tl 204.4	55B 82 Pb 207.2	56B 83 Bi 209.0	(209) 84 Po (209)	(210) 85 At (210)	(222) 86 Rn (222)	57B 87 Fr (223)	58B 88 Ra 226.0	59B 89 Ac 227.0	60B 104 Rf (261)	61B 105 Ha (262)	62B 106 Unh (263)	63B 107 Uns (262)	64B 109 Uue (267)
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metal

nonmetal

$Fe^{3+}$

$F^{-}$

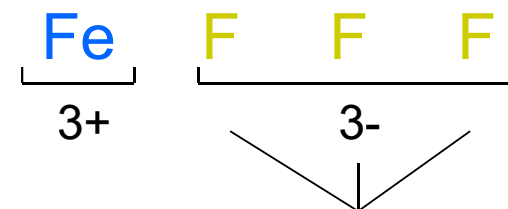
$Fe^{3+}$

$F^{-}$   $F^{-}$   $F^{-}$

Write down each element's symbol with charge.

Modify number of ions to create simplest **neutral** combination

Complete formula using subscripts.

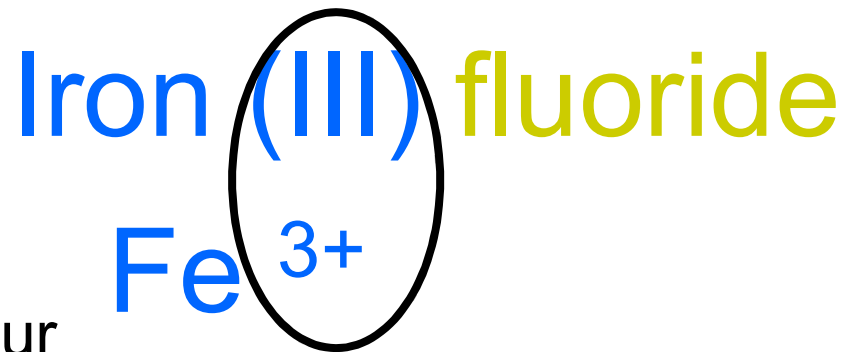


Answer:  $FeF_3$

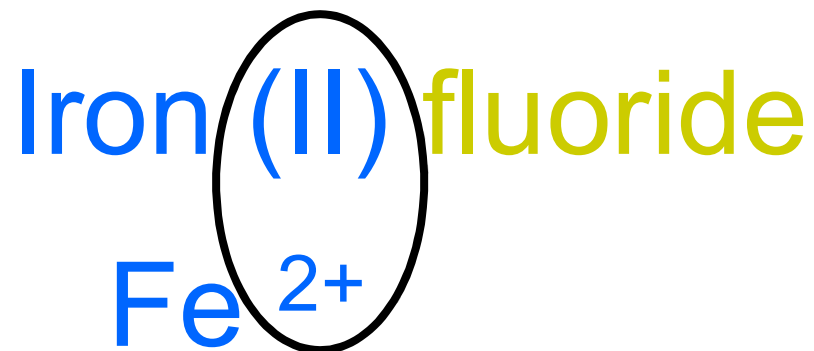


# Nomenclature: Backwards

## *Metal - Nonmetal (a.k.a. ionic)*



Watch carefully! Iron can occur with two different oxidation numbers: 3+ and 2+



# Nomenclature: Backwards

## *Metal - Nonmetal (a.k.a. ionic)*

Iron (II) fluoride  
X Y

Periodic Table

1A 1 H 1.008	2A 3 Li 6.941	3B 4 Be 9.012	5B 11 Na 23.002	6B 12 Mg 24.31	7B 13 Al 26.98	8B 14 Si 28.09	9B 15 P 30.97	10B 16 S 32.06	11B 17 Cl 35.45	12B 18 Ar 39.95	13B 19 K 39.10	14B 20 Ca 40.08	15B 21 Sc 44.96	16B 22 Ti 47.90	17B 23 V 50.94	18B 24 Cr 52.00	19B 25 Mn 54.94	20B 26 Fe 55.85	21B 27 Co 58.93	22B 28 Ni 58.70	23B 29 Cu 63.55	24B 30 Zn 65.38	25B 31 Ga 69.72	26B 32 Ge 72.59	27B 33 As 74.92	28B 34 Se 78.96	29B 35 Br 79.90	30B 36 Kr 83.80	31B 37 Rb 85.47	32B 38 Sr 87.62	33B 39 Y 88.91	34B 40 Zr 91.22	35B 41 Nb 92.91	36B 42 Mo 95.94	37B 43 Tc (98)	38B 44 Ru 101.1	39B 45 Rh 102.9	40B 46 Pd 106.4	41B 47 Ag 107.9	42B 48 Cd 112.4	43B 49 In 114.8	44B 50 Sn 118.7	45B 51 Sb 121.8	46B 52 Te 127.6	47B 53 I 126.9	48B 54 Xe 131.3	49B 55 Cs 132.9	50B 56 Ba 137.3	51B 57 La 138.9	52B 72 Hf 178.5	53B 73 Ta 180.9	54B 74 W 183.9	55B 75 Re 186.2	56B 76 Os 190.2	57B 77 Ir 192.2	58B 78 Pt 195.1	59B 79 Au 197.0	60B 80 Hg 200.6	61B 81 Tl 204.4	62B 82 Pb 207.2	63B 83 Bi 209.0	64B 84 Po (209)	65B 85 At (210)	66B 86 Rn (222)	67B 87 Fr (223)	68B 88 Ra 226.0	69B 89 Ac 227.0	70B 104 Rf (261)	71B 105 Ha (262)	72B 106 Unh (263)	73B 107 Uns (262)	74B 109 Uue (267)
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metal

nonmetal

$Fe^{2+}$

$F^{-}$

$Fe^{2+}$

$F^{-}$   $F^{-}$

Write down each element's symbol with charge.

Modify number of ions to create simplest **neutral** combination

Complete formula using subscripts.

$Fe$

$2+$

$F$   $F$

$2-$

Answer:  $FeF_2$







# Nomenclature: Charges

## *How do we determine them?*

What about the transition metals???

1A	2A		Transition Metals										3A	4A	5A	6A	7A	8A
1 H 1.008																		2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18	
11 Na 23.00	12 Mg 24.31	3B	4B	5B	6B	7B	8B			1B	2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95	
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80	
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55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)	
87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Ha (262)	106 Unh (263)	107 Uns (262)	109 Une (267)											



# Nomenclature: Charges

Transition metals: **MEMORIZE** checked ✓

✓ Chromium	Cr <sup>2+</sup>	Chromium (II)	Chrom <b>ous</b>
✓ Chromium	Cr <sup>3+</sup>	Chromium (III)	Chrom <b>ic</b>
Cobalt	Co <sup>2+</sup>	Cobalt(II)	
Cobalt	Co <sup>3+</sup>	Cobalt(III)	
✓ Copper	Cu <sup>1+</sup>	Copper(I)	Cupr <b>ous</b>
✓ Copper	Cu <sup>2+</sup>	Copper(II)	Cupr <b>ic</b>
✓ Iron	Fe <sup>2+</sup>	Iron(II)	Ferr <b>ous</b>
✓ Iron	Fe <sup>3+</sup>	Iron(III)	Ferr <b>ic</b>
✓ Lead	Pb <sup>2+</sup>	Lead(II)	
Lead	Pb <sup>4+</sup>	Lead(IV)	
✓ Mercury	Hg <sub>2</sub> <sup>2+</sup>	Mercury(I)	Mercur <b>ous</b>
✓ Mercury	Hg <sup>2+</sup>	Mercury(II)	Mercur <b>ic</b>
✓ Tin	Sn <sup>2+</sup>	Tin(II)	Stann <b>ous</b>

Endings: Latin root + **“-ous”** ion with lower charge **“-ic”** ion with higher charge 💡

# Nomenclature: **Examples**

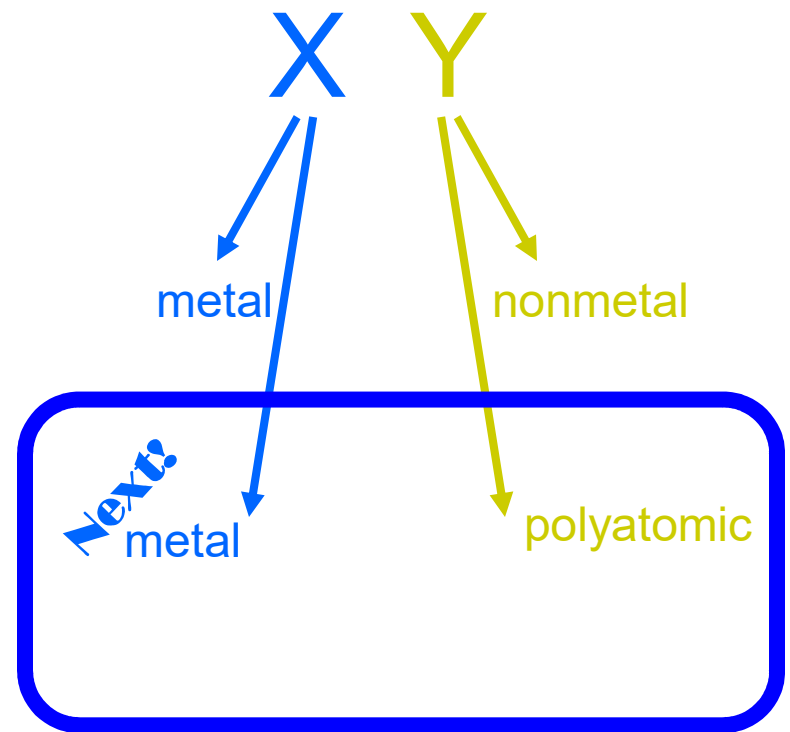
## *Metal - Nonmetal*

<b>Name</b>	<b>Charges</b>	<b>Neutral</b>	<b>Formula</b>
Cupric Chloride:	$\text{Cu}^{2+}$ $\text{Cl}^{1-}$	$\text{Cu}_1\text{Cl}_2$	$\text{CuCl}_2$
Cobalt(III) Sulfide:	$\text{Co}^{3+}$ $\text{S}^{2-}$	$\text{Co}_2\text{S}_3$	$\text{Co}_2\text{S}_3$
Chromic Bromide:	$\text{Cr}^{3+}$ $\text{Br}^{1-}$	$\text{Cr}_1\text{Br}_3$	$\text{CrBr}_3$
Mercurous Oxide:	$\text{Hg}_2^{2+}$ $\text{O}^{2-}$	$\text{Hg}_2\text{O}_1$	$\text{Hg}_2\text{O}$



# Nomenclature: ID type of compound

- Identify elements as metals, nonmetals, polyatomic ions or semimetals
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  - Metal – polyatomic
  - Nonmetal – nonmetal

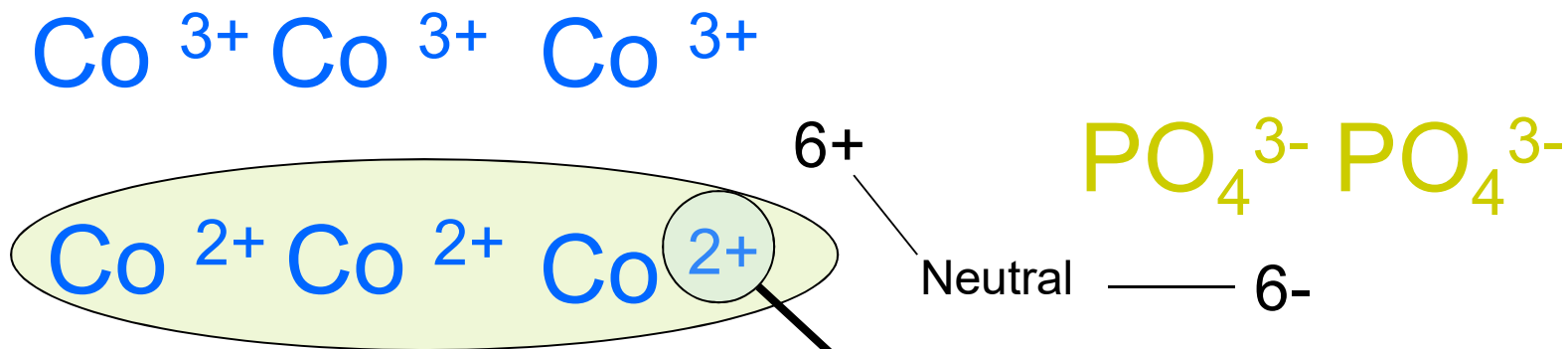




# Nomenclature: *Metal - Polyatomic*



Possible Ions:



Name: **cobalt(III) phosphate**



# Nomenclature: *Metal - Polyatomic*

Name: iron (III) nitrate

Ions:  $\text{Fe}^{3+}$   $\text{NO}_3^{1-}$

Neutral Count:  $\text{Fe}^{3+}$   $\text{NO}_3^{1-}$   $\text{NO}_3^{1-}$   $\text{NO}_3^{1-}$

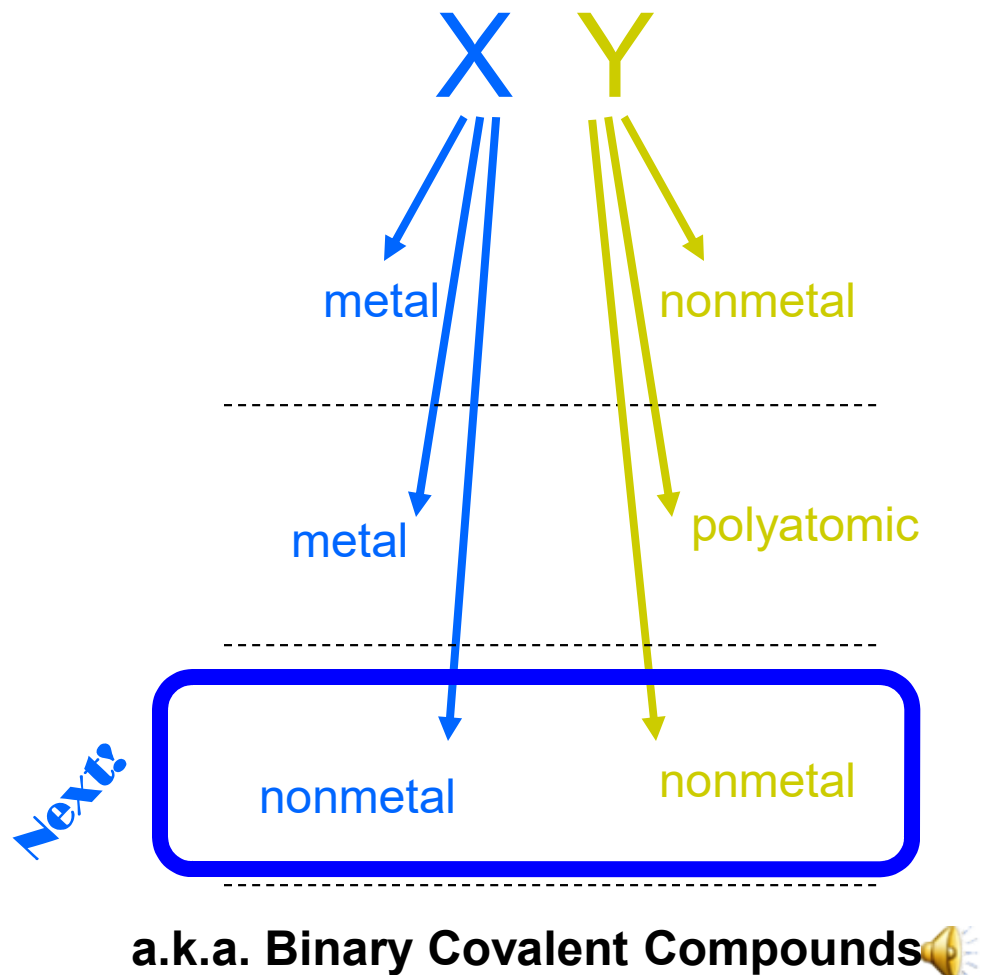
Formula:  $\text{Fe}(\text{NO}_3)_3$





# Nomenclature: ID type of compound

- Identify elements as metals, nonmetals, polyatomic ions or semimetals
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  - Metal – nonmetal
  - Metal – polyatomic
  - Nonmetal – nonmetal

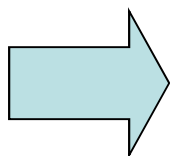




# Nomenclature: Example

## *Nonmetal – Nonmetal (a.k.a. covalent)*

Know these prefixes and how to use them.



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

# CO

carbon                  oxygen

carbon                  oxide

~~mono~~ carbon          **monoxide**

*Drop "mono" if at the beginning*

carbon                  monoxide

