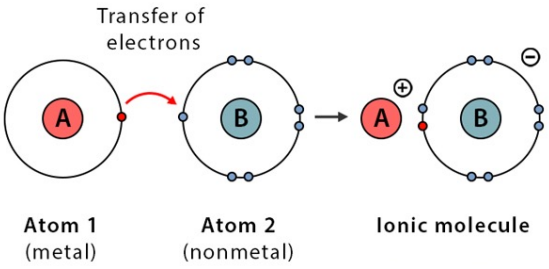
Ionic Bonding

Mechanics of the Ionic Bond

Ionic Bonding is the process of forming an ionic bond (*connection between ions*) through the transfer of electrons (e^-) between ions



The transfer of electrons is based on the **octet rule**, the rule that states atoms should have either 0 (*metals*), or 8 (*non-metals*) valence electrons in their ion form (*cation and anion*)

Atoms that are part of an ionic bond are connected together through the + and – ion attraction in an ionic compound (*cation to anion attraction*)

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Ionic Bonding

From Ions to Ionic Bonds

Ionic Bonds are the connection between to atoms due to the transfer of electrons between a metal (*+ ion*) and non-metal (*- ion*)

Cation (+ ion): Ions formed due to gaining electrons (*metals*)

Anion (- ion): Ions formed due to losing electrons (*non-metals*)

Group	Val e^-	Charge	Group	Val e^-	Charge	Group	Val e^-	Charge
1A (1)	1	1+	**3A (13)**	3	3+	**6A (16)**	6	2-
2A (2)	2	2+	**4A (14)**	4	4+ / 4-	**7A (17)**	7	1-
1B – 10B (3 – 12)	2 (Varies)	Varies	**5A (15)**	5	3-	**8A (18)**	8	No Charge

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Ion Review – Polyatomic Ions

Standard Base Form Polyatomic Ions

+1 Polyatomic Ions		-1 Polyatomic Ions		-2 Polyatomic Ions		-3 Polyatomic Ions	
H_3O^{1+}	Hydronium Ion	FO_3^{1-}	Fluorate Ion	CO_3^{2-}	Carbonate Ion	PO_4^{3-}	Phosphate Ion
NH_4^{1+}	Ammonium Ion	ClO_3^{1-}	Chlorate Ion	$C_2O_4^{2-}$	Oxalate Ion		
		BrO_3^{1-}	Bromate Ion	SO_4^{2-}	Sulfate Ion		
-1 Polyatomic Ions		IO_3^{1-}	Iodate Ion	$S_2O_3^{2-}$	Thiosulfate Ion		
OH^{1-}	Hydroxide Ion	NO_3^{1-}	Nitrate Ion	HPO_4^{2-}	Hydrogen Phosphate		
CN^{1-}	Cyanide Ion	$C_2H_3O_2^{1-}$	Acetate Ion	CrO_4^{2-}	Chromate Ion		
SCN^{1-}	Thiocyanate Ion	HCO_3^{1-}	Bicarbonate Ion	$Cr_2O_7^{2-}$	Dichromate Ion		
OCN^{1-}	Cyanate Ion	MnO_4^{1-}	Permanganate Ion				

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Writing Ionic Compounds Review

Elements	Mn^{3+}	$C_2H_3O_2^{1-}$
Ion Charge	+3	−1
Cross Method	$Mn(C_2H_3O_2)$ Show Arrows	
Ionic Formula	$Mn(C_2H_3O_2)_3$	

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Writing Ionic Compounds Review

group 6A = -2

sed on the chart below using

Elements	Cr^{4+}	S
Ion Charge	+4	−2
Cross Method	Cr S → $Cr_2 S_4$ (Show Arrows; Reduce!)	
Ionic Formula	$Cr S_2$	

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Writing Ionic Compounds Review

Elements	Mg	PO_4^{3-}
Ion Charge	+2	−3
Cross Method	$Mg(PO_4)$ (Show Arrows)	
Ionic Formula	$Mg_3(PO_4)_2$	

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Ionic Nomenclature

Naming Ionic Compounds

Naming Format

Representative Metals (1A,2A,Al,Si)	Transition Metals (1B – 10B, 3A [In, Tl] 4A [Pb, Sn])

Metal + Non-Metal –ide **Metal (Charge) Non-Metal -ide**

Roman Numerals

1	2	3	4	5	6	7	8
I	II	III	IV	V	VI	VII	VIII

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Anion Non-Metal Endings

-ide Non-Metal Endings

Atomic Number	Element Name	Ion Name	Atomic Number	Element Name	Ion Name
6	Carbon	Carbide	16	Sulfur	Sulfide
7	Nitrogen	Nitride	17	Chlorine	Chloride
8	Oxygen	Oxide	34	Selenium	Selenide
9	Fluorine	Fluoride	35	Bromine	Bromide
15	Phosphorous	Phosphide	53	Iodine	Iodide

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Elements with Different Names/Symbols

The following element names don't match symbol

#	Symbol	Element	#	Symbol	Element
11	Na	Sodium	51	Sb	Antimony
19	K	Potassium	74	W	Tungsten
26	Fe	Iron	79	Au	Gold
29	Cu	Copper	80	Hg	Mercury
47	Ag	Silver	82	Pb	Lead
50	Sn	Tin	85	At	Astatine

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Ionic Compound Formula Breakdown

A_xB_y | $A_x(B_yC_z)_d$ | $(A_xC_z)_dB_y$

Binary | − Poly Ion | + Poly. Ion

A: Metal (Periodic Table) B: Non-Metal (PT)

B_yC_z and A_xC_z: Polyatomic Ion (Chart)

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Naming Ionic Compounds

Na_3P_2	
Ion	Ion Name
Na	Sodium Ion
P	Phosphide Ion
Ionic Compound Name	
Sodium Phosphide	

no charge = no ( )

check ion - ide name!

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Naming Ionic Compounds

poly ion see chart!

needs ( ) Cd_2HPO_4

Ion	Ion Name
Cd^{1+}	Cadmium (I) Ion
HPO_4^{2-}	Hydrogen Phosphate Ion
Ionic Compound Name	
Cadmium (I) Hydrogen Phosphate	

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Naming Ionic Compounds

Poly Ion
see Chart!
no charge
no ( )

$Al(MnO_4)_3$	
Ion	Ion Name
Al	Aluminum Ion
MnO_4^{1-}	Permanganate Ion
Ionic Compound Name	
Aluminum Permanganate	

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Ionic Compound Nomenclature

	*Left Side of Name**			*Right Side of Name**	
Atom or Ion	Representative Metal Ion	Transition Metal Ion	(+) Polyatomic Ion	Non-Metal Ion	(-) Polyatomic Ion
Ion Ending	-ium / -um	_____ (+)	-ium	-ide	-ate or -ide
Formula	Periodic Table [*group = charge*]	Periodic Table [(+) = charge]	Polyatomic Ion Chart	Periodic Table [*group = charge*]	Polyatomic Ion Chart
Groups & Polyatomic Ion Forms	Groups 1A, 2A, Al, & Si Si = +4	Groups 1B – 8B + In, Tl, Sn, Pb, Bi	Two Elements Single Ion	Groups 4A – 7A	Two or More Elements Single Ion
Example Ions	Sod**ium** Alumin**um**	Iron(III) Lead(IV)	Ammon**ium** Hydron**ium**	Chlor**ide** Sulf**ide**	Chlor**ate** Cyan**ide** Hydrox**ide**

***Form**: *Left Side* (*Charge*) *Right Side* + *ending*

*Covalent Compound Nomenclature Prefixes**

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

***Form**: *Prefix Non-Metal* + *Prefix Non-Metal* (*-ide*)

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