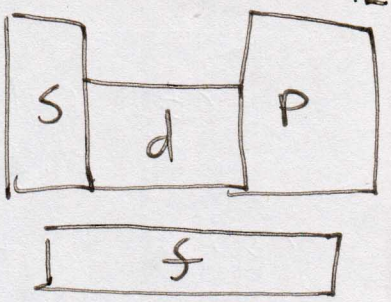
Mg: $1s^2 2s^2 2p^6 \underline{3s^2}$ 2 valence e^-

S: $1s^2 2s^2 2p^6 \underline{3s^2 3p^4}$ 6 valence e^-



$Mg \rightarrow Mg^{+2}$ $S \rightarrow S^{-2}$

Naming monatomic ions

cations in the main group (s+p blocks)

- Names of cations are identical to the element names,

Na^+ → sodium ion

cations of transition elements (d block)

- Transition elements frequently can form ions with different charges. To name a specific cation, a Roman numeral is used to specify the charge of the ion,

Fe^{+2} - iron (II) ferrous

Fe^{+3} - iron (III) ferric

anions in the main group

- Most anion names end with -ide.

F	fluorine	F^-	fluoride
Cl	chlorine	Cl^-	chloride
O	oxygen	O^{-2}	oxide
N	nitrogen	N^{-3}	nitride
S	sulfur	S^{-2}	sulfide
P	phosphorus	P^{-3}	phosphide

Naming ionic compounds

- When writing formulas for ionic compounds, charge is always balanced.

NaCl sodium chloride (cation then anion)

Ca^{+2} Cl^- $\longrightarrow$ $CaCl_2$ calcium chloride

aluminum oxide Al^{+3} O^{-2} $\longrightarrow$ Al_2O_3

FeN $\longrightarrow$ Fe^{+3} N^{-3} $\rightarrow$ iron (III) nitride

polyatomic ions

NO_3^-	nitrate		
NO_2^-	nitrite		
SO_4^{-2}	sulfate	PO_4^{-3}	phosphate
CO_3^{-2}	carbonate	HCO_3^-	hydrogen carbonate (bicarbonate)

Ions that end in -ite have one less oxygen than ions that end in -ate

HPO_4^{-2}	hydrogen phosphate		
$H_2PO_4^-$	dihydrogen phosphate		
CN^-	cyanide	OH^-	hydroxide
CrO_4^{-2}	chromate	$Cr_2O_7^{-2}$	dichromate
MnO_4^-	permanganate	$C_2H_3O_2^-$	acetate
		$CH_3CO_2^-$	
		CH_3COO^-	
NH_4^+	ammonium	(NH_3 ammonia)	

names + formulas of compounds with polyatomic ions

magnesium nitrate Mg^{+2} NO_3^- $\rightarrow$ $Mg(NO_3)_2$

- If there is more than one of a specific polyatomic ion in a compound, that ion written with parentheses when writing the full formula.

ammonium chloride NH_4^+ Cl^- $\longrightarrow$ NH_4Cl

aluminum hydrogen phosphate Al^{+3} HPO_4^{-2} $\longrightarrow$ $Al_2(HPO_4)_3$

calcium dichromate Ca^{+2} $Cr_2O_7^{-2}$ $\longrightarrow$ $CaCr_2O_7$

naming of covalent compounds

N_2O_4 dinitrogen tetraoxide

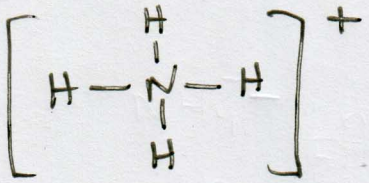
- In covalent names, the first element is named like a cation and the second element like an anion,
- covalent names use numerical prefixes to specify how many of each element is present,
  - ↳ one exception - if there is only one of the first element listed, the prefix is omitted.

SO_3 sulfur trioxide

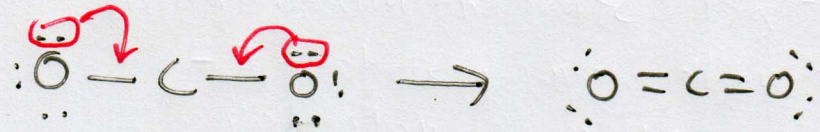
1 mono-	6 hexa-
2 di-	7 hepta-
3 tri-	8 octa-
4 tetra-	9 nona-
5 penta-	10 deca-

Lewis dot structures

NH_4^+ # valence electrons = $\overset{N}{1}\times 5 + \overset{H}{4}\times 1 - \overset{(+)}{1} = 8$

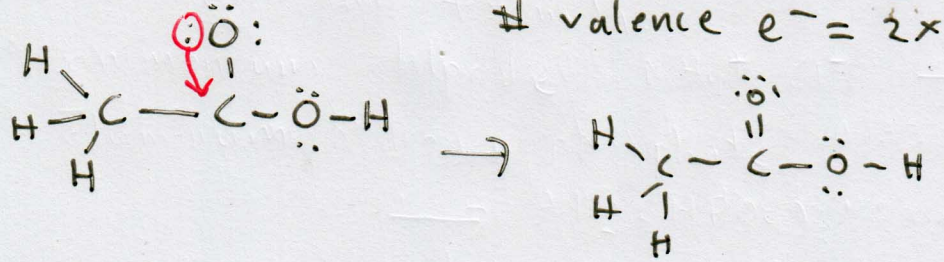


CO_2 # valence $e^- = \overset{C}{1}\times 4 + \overset{O}{2}\times 6 = 16$



CH_3COOH (acetic acid)

valence $e^- = \overset{C}{2}\times 4 + \overset{O}{2}\times 6 + \overset{H}{4}\times 1 = 24$



NO_2 # valence e^- = N 1×5 + O 2×6 = $17 e^-$

- Free radicals are molecules that have single (unpaired) electrons.

Valence shell electron pair repulsion (VSEPR)

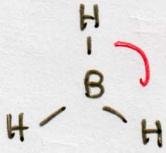
"vesper"

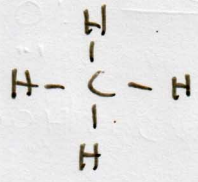
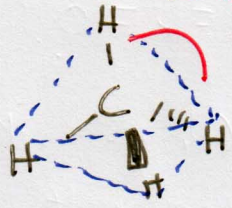
valence shell – the valence shell contains the highest energy electrons that will participate in bonding and therefore affect the shape of a molecule

electron pair – electrons normally occupy atoms in pairs (lone or bonding)

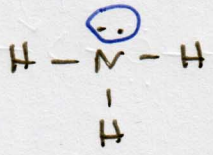
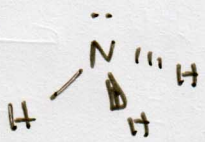
repulsion – like-charged electrons attempt to get as far away from each other as possible to minimize energy

BeH_2  180° linear

BH_3  120° trigonal planar

CH_4 methane   109.5° tetrahedral

lone pair

$:NH_3$   trigonal pyramidal

lone pairs effective have more repulsion than bonding pairs of electrons, so lone pairs distort molecular geometry