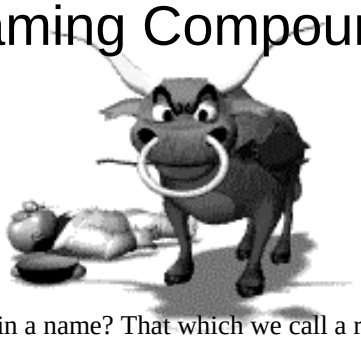
Naming Compounds



What's in a name? That which we call a rose
By any other name would smell as sweet."

- William Shakespeare, Romeo and Juliet (II, ii)

Background: valences and formulas

- We can determine the formula of a compound by completing Lewis diagrams or via "valence"
- Valence is "the number of electrons an atom must gain, lose, or share to complete its octet"
- For representative elements valence starts at 1 (IA), climbs to 4 (IVA) and falls back to 1 (VIIA)
- By knowing the valence of elements you can determine the formula of compounds
- E.g. what compound would form from C + S?
  - Step 1 - write valences: C^4S^2
  - Step 2 - cross down valences: C_2S_4
  - Step 3 - simplify formula: CS_2

a) Al,Br b) K,S c) Zn,O d) Mg,N e) C,Cl f) Cu,O

Ionic compounds (metal with 1 valence)

Rules for naming

- Names end in -ide. Example: sodium chloride
- Metal (+ve ion) comes 1st (not chorine sodide)
- Use the group valence for nonmetals
- Do not capitalized unless starting a sentence

Give formulae & name: Ca + I, O + Mg, Na + S

Multiple valence: Latin naming

- When the metal in an ionic compound is multi-valent there are 2 methods: Latin or IUPAC
- Latin is older (not useful for some compounds)
- As before, the name ends in -ide & +ve is first
- The metal is named with it's Latin or English root and ends in -ic or -ous to denote valence
- E.g. Cu^1 is cuprous, E.g. Cu^2 is cupric
- L**o**wer = **o**us, H**i**gher = **i**c
- Give formulas and Latin names for:
  Cu^2 + Cl =
  Co^2 + Cl =
- For Latin naming: know rules, remember Hg is an exception, do not memorize Latin names

Element (valence)	English name	Latin Name	Higher valence	Lower valence
Metals that have and use latin names				
Cu (1,2)	Copper	Cuprum	Cupric	Cuprous
Fe (2,3)	Iron	Ferrum	Ferric	Ferrous
Pb (2,4)	Lead	Plumbum	Plumbic	Plumbous
Sn (2,4)	Tin	Stannum	Stannic	Stannous
Metals that do not have latin names				
Co (2,3)	Cobalt	-	Cobaltic	Cobaltous
Cr (2,3)	Chromium	-	Chromic	Chromous
Mn (2,3)	Manganese	-	Manganic	Manganous
Metals that have latin names but use english root				
Hg (1,2)	Mercury	Hydrargyrum	Mercuric	Mercurous

Multiple valence: IUPAC naming

- Name ends in -ide, positive/metal comes first
- The valence of the metal is indicated in brackets using roman numerals
- E.g. Cu^1 is copper(I), Cu^2 is copper(II)
- Numbers refer to valences not to #s of atoms
- Try: Cu^2+Cl, Zn^2 + Cl, Co^2+Cl, Hg+S (do both)

Compounds containing polyatomic ions

- So far we have given valences to single atoms
  Li + O $Li^1O^2 \rightarrow Li_2O$
- Groups of atoms can also have valences
- "Polyatomic ions" are groups of atoms that interact as a single unit. For valence see p95.
- E.g. OH^1, $(SO_4)^2$. $Ba_3(PO_4)_2$ =
- Naming compounds with polyatomic ions is similar to naming other ionic compounds
- You should note that compounds with polyatomic ions have names ending in -ate or -ite not -ide
- Note that most are negative, except ammonium
- Name: $Ca(OH)_2$, $CuSO_4$, NH_4NO_3, $Co_2(CO_3)_3$

Naming covalent compounds

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

- -ide ending, each element has "prefix"
- prefix refers to # of atoms - not valence
  N_2O_4 = dinitrogen tetroxide
- Exception: drop mono for first element
  CO_2 = carbon dioxide
- The first vowel is often dropped to avoid the combination of "ao" or "oo".
  CO = carbon monoxide (~~monooxide~~)
  P_4O_{10}= tetraphosphorus decoxide
  SO_2= sulfur dioxide (~~doxide~~)
- Name: CCl_4, P_2O_3, IF_7