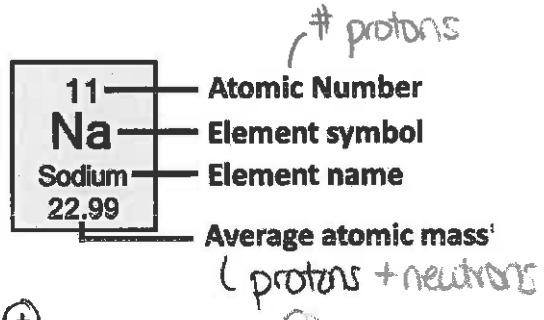
Atoms vs Ions

Atoms

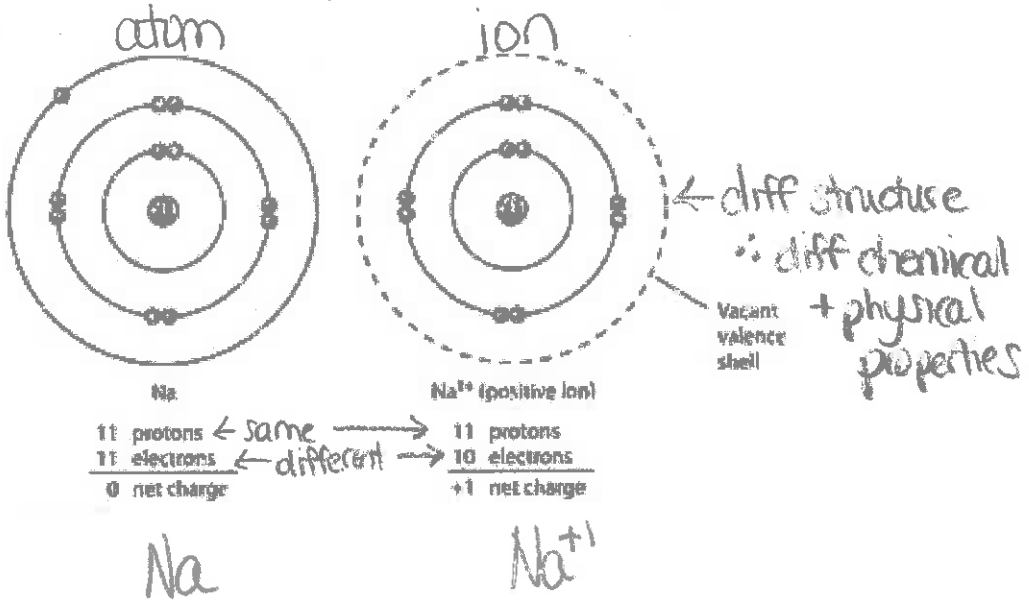
- Comprised of positively charged protons and neutral neutrons in a nucleus, surrounded by negatively charged electrons orbiting the nucleus



- The atomic number defines the number of protons
- While the atomic mass is the sum of protons and neutrons
- Atoms are neutral; they contain the same number of protons and electrons
  - E.g. a sodium atom contains 11 protons and 11 electrons

Ions

- In an ion, electrons have been gained or lost, resulting in an electrical charge (+ or −)
- Positively charged ions, called cations, result from an atom losing one or more electrons. (metals)
  - By removing an electron from sodium, we get a positively charged Na^+ ion that has a net charge of +1.
- Negatively charged ions, called anions, result from an atom gaining one or more electrons. (non-metals)
  - A neutral chlorine atom, for example, contains 17 protons and 17 electrons.
  - By adding one more electron we get a negatively charged Cl^- ion with a net charge of -1.
- When an ion is formed, the number of protons does not change.



Naming Compounds Flowchart

Compounds

Ionic (m + nm)

Binary (2 elements)

- contains only monatomic ions--find charges from the PT
- name by cation 1st, anion 2nd
- always change second listed element ending to "ide"

Ternary (3+ elements)

- contains at least one polyatomic ion--look to polyatomic ion list first and identify
- name by cation 1st, anion 2nd
- already ends in "ite" or "ate", there are a few "ide" exceptions: no change needed

Acids (H + anion)

Acids (2 + elements)

- always contains H^+ as cation and an anion, poly- or monatomic
- Anion **DOES NOT** contain oxygen--use a "hydro" + anion root + "ic"
- Anion **DOES** contain oxygen
  1. anions ending in "ate" root anion + "ic" ending
  2. anions ending in "ite" root anion + "ous" ending
- add "acid" to name at end

Molecular (nm + nm)

aka covalent

Binary (2 elements)

- name by element
- use prefixes to indicate how many of each element are present in the formula
- always change second listed element ending to "ide"

Some Common Polyatomic Ions

$C_2H_3O_2^{-1}$	acetate	CO_3^{-2}	carbonate
ClO_4^{-1}	perchlorate	CrO_4^{-2}	chromate
ClO_3^{-1}	chlorate	$Cr_2O_7^{-2}$	dichromate
ClO_2^{-1}	chlorite	HPO_4^{-2}	hydrogen phosphate
ClO^{-1}	hypochlorite	$C_2O_4^{-2}$	oxalate
CN^{-1}	**cyanide**	SO_3^{-2}	sulfite
$H_2PO_4^{-1}$	dihydrogen phosphate	SO_4^{-2}	sulfate
HCO_3^{-1}	bicarbonate (or H carbonate)	O_2^{-2}	**peroxide**
HSO_3^{-1}	bisulfite (or H sulfite)		
HSO_4^{-1}	bisulfate (or H sulfate)		
OH^{-1}	**hydroxide**		
NO_2^{-1}	nitrite	PO_3^{-3}	phosphite
NO_3^{-1}	nitrate	PO_4^{-3}	phosphate
MnO_4^{-1}	permanganate		
BrO_3^{-1}	bromate	NH_4^{+1}	**ammonium**
IO_3^{-1}	iodate		

Bold--exceptions to "ite" or "ate" endings

Common Polyvalent Ions
(for use w/Roman Numerals)

Cu	+1, +2
Hg	+1, +2
Fe	+2, +3
Mn	+ 2, +3
Co	+2, +3
Cr	+2, +3
Sn	+2, +4
Pb	+2, +4

Prefixes
(molecular use only)

mono-	one
di-	two
tri-	three
tetra-	four
penta-	five
hexa-	six
hepta-	seven
octa-	eight
nona-	nine
deca-	ten

Naming Compounds

① Identify metals/non metals first then ionic/covalent/acid.

② Follow the rules (see chart)!

Eg. KCl - potassium chloride
$MgCO_3$ - magnesium carbonate
HBr - hydrobromic acid
HF - hydrofluoric acid
SO_2 - sulfur dioxide
N_2O_4 - dinitrogen tetroxide

Writing Formulas

Ionic
- criss cross the valence charges
- watch polyatomic ions and polyvalent ions

Eg. aluminum oxide
Al^{+3} O^{-2}
Al_2O_3

calcium phosphate
Ca^{+2} PO_4^{-3}
$Ca_3(PO_4)_2$ ← brackets needed

iron(II) oxide vs iron(III) oxide
Fe^{+2} O^{-2} Fe^{+3} O^{-2}
FeO Fe_2O_3

Covalent
- has prefixes

Eg. carbon dioxide
CO_2

diarsenic pentoxide
As_2O_5

Acids

"ic" acids
- find the 'ate' ion & balance Hs

Eg. phosphoric acid
H^+ PO_4^{-3}
H_3PO_4