Naming Binary Compounds (Mostly Ionic Compounds)

Rules:
1. Determine which element is the cation. The cations are usually found toward the left of the periodic table and are written first in the name and formula of a molecule.
2. Determine which element is the anion. The anions are non-metals (or hydrogen), located on the right side of the periodic table, and are written second in the name and formula of a molecule.
3. Write the cation first using the name of the element.
4. Write the anion second, dropping the usual ending and replacing it with "ide".

element	anion
fluorine	fluoride
chlorine	chloride
bromine	bromide
iodine	iodide
hydrogen	hydride

element	anion
oxygen	oxide
sulphur	sulphide
nitrogen	nitride
phosphorous	phosphide
carbon	carbide

eg. KCl = potassium chloride

Writing Chemical Formulae

Rules:
1. Write the chemical symbol for the cation first, followed by the symbol of the anion.
2. Write the charge of each ion above each symbol.
3. Cross the charges, ignoring the signs.
4. Reduce the numbers if there is a common factor.
5. If the number beside an element is 1, do not write it.

(The total positive charge will now equal the total negative charge in the molecule.)

Example: silicon oxide

Rule 1	Si	O
Rule 2	Si^{+4}	O^{-2}
Rule 3	Si_2O_4	
Rule 4	SiO_2	

Multiple Valences

Latin method – "ous/ic"

Many cations have more than one possible charge. The latin method is the oldest method used to deal with this program, and while it can't be used for many molecules, it is still used in industry.

Rules:
1. Determine the charge on the cation.
2. Select the proper name for the cation.
   a) The "ous" ending refers to the lower cation charge.
   b) The "ic" ending refers to the higher cation charge.
3. Write the name of the anion as before, using the "ide" ending

element	higher charge		lower charge	
gold	+3	auric	+1	aurous
mercury	+2	mercuric	+1	mercurous
lead	+4	plumbic	+2	plumbous
phosphorous	+5	phosphoric	+3	phosphorous

element	higher charge		lower charge	
iron	+3	ferric	+2	ferrous
copper	+2	cupric	+1	cuprous
tin	+4	stannic	+2	stannous
antimony	+5	stibbic	+3	stibbous
		antimonic		antimonous

IUPAC (Roman Numeral) Method

The IUPAC (International Union of Pure and Applied Chemists) method is a standardized nomenclature system that always works. The Roman Numerals are NOT used when there is only one possible positive valence (ie Columns I, II, III, Ag, Zn and Cd).

Rules:

1. Determine the charge on the anion (there is only one possibility).
2. Determine the total negative charge by multiplying the anion charge by the number of anions present.
3. The total positive charge equals the total negative charge in a neutral molecule.
4. Divide the total negative charge by the number of cations present to determine the charge on each cation.
5. Write down the name of the cation.
6. Write the charge on the cation using Roman Numerals in brackets after the cation.
7. Write down the name of the anion using the "ide" ending.

eg. Fe_2O_3

1. charge on O = -2
2. total negative charge = $-2 \times 3 = -6$
3. total positive charge = +6
4. charge on iron = $+6 \div 2 = +3$
5. name of molecule = iron (III) oxide

Polyatomic Ions

Many ions consist of more than one element. These ions all have special names which you will not need to memorize. A chart of the compound ions will be provided to you for all tests and quizzes.
The charge given in the chart is the charge on the compound ion as a unit.
Compound molecules are named using the IUPAC system, the only difference being that if more than one of the compound ions is needed to form a neutral molecule, brackets are placed around the ion.

nitrate	NO_3^{-1}		carbonate	CO_3^{-2}
fluorate	FO_3^{-1}		sulphate	SO_4^{-2}
chlorate	ClO_3^{-1}		phosphate	PO_4^{-3}
bromate	BrO_3^{-1}		hydrogen carbonate	HCO_3^{-1}
iodate	IO_3^{-1}		hydrogen sulphate	HSO_4^{-1}
hydroxide	OH^{-1}		monohydrogen phosphate	HPO_4^{-2}
ammonium	NH_4^{+1}		dihydrogen phosphate	$H_2PO_4^{-1}$

eg. iron (III) sulphate = Fe^{+3} SO_4^{-2}

$Fe_2(SO_4)_3$