OVERKILL

Here is the same story once again stated a little differently… And of course more practice as requested! Note the answers are included!!! For all the sheets!

When naming compounds, remember the following rules:

Binary Ionic Compounds (Type I)

1. The cation (positively charged ion; $Na^{+,}$ Al^{3+}) is always named first and the anion (negatively charged ion; Cl^{-}, O^{2-}) second.
2. A monatomic (meaning one-atom) cation takes its name from the name of the element. For example, Na^{+} is called sodium in the names of compounds containing this ion.
3. A monatomic anion is named by taking the root of the element name and adding *-ide*. Thus, the Cl^{-} ion is called chloride, the S^{2-} ion is called sulfide, and the O^{2-} ion is called oxide.

Some common monatomic cations and anions are shown below

Cation	Name	Cation	Name	Anion	Name	Anion	Name
H^{+}	Hydrogen	Li^{+}	Lithium	H^{-}	Hydride	F^{-}	Fluoride
Na^{+}	Sodium	K^{+}	Potassium	Cl^{-}	Chloride	Br^{-}	Bromide
Cs^{+}	Cesium	Be^{2+}	Beryllium	I^{-}	Iodide	O^{2-}	Oxide
Mg^{2+}	Magnesium	Ca^{2+}	Calcium	S^{2-}	Sulfide	Se^{2-}	Selenide
Ba^{2+}	Barium	Al^{3+}	Aluminum	N^{3-}	Nitride	P^{3-}	Phosphide
Zn^{2+}	Zinc	Ag^{+}	Silver	As^{3-}	Arsenide	C^{4-}	Carbide

Binary Ionic Compounds (Type II)

1. The cation of a transition metal is always named first (like any cation) and the anion second.
2. A monatomic (meaning one-atom) cation takes its name from the name of the element. For example, Cu^{+} is called Copper(I) and Cu^{2+} is called Copper(II) in the names of compounds containing these ions. The number in parentheses is the charge of the cation.
3. *All* transition metal cations, except Zn^{2+}, Cd^{2+}, and Ag^{+} (which *always* have the charges shown here), *must* show the oxidation number (charge) in parantheses following the English spelling of the element, such as Iron(III), Copper(I), or Vanadium(V), whenever a compound containing these ions, which have multiple charges, is named.
4. For the cations in Groups IIIA-VIA (including, Sn, Pb, Ga, Bi, etc.) also have multiple charges, even though they are not transition metals. For all the metals in these groups (except Al, which, of course, *always* has a +3 charge), include a paranthesis after the name, and show its positive charge as a Roman numeral (Pb^{2+} is Lead(II) in names)

Binary Covalent Compounds (Type III)

Compounds containing only non-metal elements are named using Type III binary compound rules. These compounds are always neutral (not ions which have charges), and consist of only two elements (see acid naming below for compounds containing only non-metal elements, but with more than two elements. The prototypical compound is CO_2, which is called carbon dioxide.

1. The first element shown in the compound is named as the element (e.g., for CO_2, first element is "carbon")
2. The second element shown in the compound is named according to the anion name, ending in *-ide* (e.g., for CO_2, the second element is named "oxide")
3. The second element always carries a prefix indicating the number of times it is present in the compound (e.g., for CO_2, the second element (oxide) is present twice, so it has the "di" prefix)
4. The amount of the first element is only shown, if it is present more than once. It is assumed to be present only once, hence just the name of the element. However, if it is present more than once, you must then specify the number of times it is duplicated (di, tri, tetra, etc.)

The following prefixes are used to specify the number of times an element is present in binary compounds:

• 1 — mono • 2 — di • 3 — tri • 4 — tetra • 5 — penta	• 6 — hexa • 7 — hepta • 8 — octa • 9 — nona • 10 — deca	**Examples using prefixes:** • CCl_4 — carbon tetrachloride • P_2O_5 — diphosphorus pentoxide • N_2O — ninitrogen monoxide • ICl_3 — iodine trichloride

Please note that ionic compounds (Type I & II binary compound names) *never* use prefixes to specify how many times an element is present. Prefixes are *only* used for covalent compounds formed from non-metal elements.

Common Acid and Anion Names

Acids are compounds containing an ionizable proton (H^+), since an acid is a proton donor (a hydrogen atom which has lost its electron). The polyatomic anions derived from acids are named by dropping the *-ic* (or *-ous*) suffix from the acid name and adding the *-ate* (or *-ite*) suffix, respectively. Compounds containing polyatomic anions are named using the **Type I** or **Type II** naming systems described above. For example, the sodium salt of nitric acid is sodium nitrate ($NaNO_3$). If you know the acid formula you will *always* get the correct anion formula and its charge, since the charge is equal to the number of ionizable hydrogen atoms in the acid, and is always negative. For example, for sulfuric acid (H_2SO_4), the anion is sulfate (SO_4^{2-}) with a -2 charge.

Acids which do *not* contain oxygen (e.g., HCl, H_2S, HF) are named by adding the *hydro-* prefix to the root name of the element, followed by the *-ic* suffix. HCl is *hydro*chlor*ic* acid, H_2S is *hydro*sulfur*ic* acid, and HF is *hydro*fluor*ic* acid (*italics* added for emphasis). Anions of these acids, which contain a single element (not polyatomic), are named as a regular non-metal anion (i.e., Cl^- is chloride, S^{2-} is sulfide, and F^- is fluoride).

Acid	**Name**	**Anion**	**Name**		**Acid**	**Name**	**Anion**	**Name**
H_2SO_4	sulfuric	SO_4^{2-}	sulfate		HCl	hydrochloric	Cl^-	chloride
HNO_3	nitric	NO_3^-	nitrate		HBr	hydrobromic	Br^-	bromide
H_3PO_4	phosphoric	PO_4^{3-}	phosphate		$HClO_3$	chloric	ClO_3^-	chlorate
$HC_2H_3O_2$	acetic	$C_2H_3O_2^-$	acetate		$HClO_2$	chlorous	ClO_2^-	chlorite
H_2SO_3	sulfurous	SO_3^{2-}	sulfite		$HBrO_3$	bromic	BrO_3^-	bromate
HNO_2	nitrous	NO_2^-	nitrite		HBrO	hypobromous	BrO^-	hypobromite

Remember all the answers are included in this section. Take your time and practice practice practice!!!