Rules for naming compounds.

First of all, decide if the compound is ionic, covalent-molecular or an acid. Each of these three has its own rules that cannot be mixed and matched.

Naming ionic compounds: Name the cation then the anion.

Examples:	$NaNO_3$	sodium nitrate
	Na_2SO_4	sodium sulfate
	$CaCl_2$	calcium chloride
	K_3PO_4	potassium phosphate
	$(NH_4)_3PO_4$	ammonium phosphate
	$Mg(CN)_2$	magnesium cyanide

Do not use capital letters — these are not proper nouns. Do not use parentheses unless you have to. For example, do not write the formula for sodium sulfate as $Na_2(SO_4)$. In the case of ammonium phosphate, it was necessary to use parentheses in order to indicate there are three ammonium cations. Notice how we needed parentheses for magnesium cyanide, but not for calcium chloride. Do not use numerical prefixes such as mono-, di-, tri-, etc. when naming ionic compounds — those are only used in naming covalent molecular compounds.

The main trick to writing formulas from the names is to recall what is the charge on the cation and on the anion. For example, if we were to name calcium nitrate, we would start with realizing that the ions involved are Ca^{2+} and NO_3^-, so the formula has to be $Ca(NO_3)_2$. Note that we do not indicate any charges on/on/around the formula.

In addition to naming the polyatomic anions from the flashcards, you need to know that anions with a single type of atom are named with –ide endings. Group 7 forms -1 anions (e.g. Cl^-, chloride), Group 6 forms -2 anions (e.g. S^{2-}, sulfide), and Group 5 forms -3 anions (e.g. N^{3-}, nitride). This "rule" can be extended to other anions that may otherwise be unfamiliar to you. For example, Te^{2-}, the anion of tellurium, would likely be named telluride. Polyatomic anions avoid the –ide endings as a rule (sulfate, sulfite), however a few such as cyanide break the rule.

When anions contain the same two types of atoms and one of them is oxygen, the one with the fewer oxygen atoms is named with an –ite ending and the one with the greater number of oxygen atoms is named with an –ate ending. Examples include nitrite and nitrate as well as sulfite and sulfate. While you should memorize these four common anions, this knowledge can be extended to similar polyatomic anions. For example SeO_3^{2-} and SeO_4^{2-} are named selenite and selenate. The ions PO_3^{3-} and PO_4^{3-} are named phosphite and phosphate.

The –ite and –ate endings are extended to situations where more than two possibilities exist. This is basically limited to the halogens with oxygen in which case there are four possibilities. In addition to –ite and –ate, we have hypo- + -ite and per- + -ate:

-ide	F^-, fluoride	Cl^-, chloride	Br^-, bromide	I^-, iodide
hypo- + -ite	FO^-, hypofluorite	ClO^-, hypochlorite	BrO^-, hypobromite	IO^-, hypoiodite
-ite	FO_2^-, fluorite	ClO_2^-, chlorite	BrO_2^-, bromite	IO_2^-, iodite
-ate	FO_3^-, fluorate	ClO_3^-, chlorate	BrO_3^-, bromate	IO_3^-, iodate
per- + -ate	FO_4^-, perfluorate	ClO_4^-, perchlorate	BrO_4^-, perbromate	IO_4^-, periodate

When transition metals are involved as cations, various charges are possible for the cation. For example, chromium can be either +2 or +3, platinum can be +2 or +4, and copper can be +1 or +2. We indicate what the cation charge is with capital Roman numerals in parentheses after the element name.

Examples: $Cr(NO_2)_3$ chromium(III) nitrite (because $Cr(NO_2)_3$ contains Cr^{3+})
$CuClO_4$ copper(I) perchlorate (because $CuClO_4$ contains Cu^+)
$Pt_3(PO_4)_4$ platinum(IV) phosphate (because $Pt_3(PO_4)_4$ contains Pt^{4+})

Naming covalent molecular compounds: Left then right, use prefixes. First name the element that is leftmost on the periodic table. Use just the element name. If both elements are in the same column (e.g. sulfur and oxygen), name the lower one first. Name the second element as if it were an anion that uses the –ide ending. Because we cannot use charges to figure out how many of each atom we have (like we did with ionic compounds), we have to specify with prefixes mono-, di-, tri-, tetra, penta-, hexa-, and so on. The first atom is assumed to be mono- unless otherwise specified.

Examples:			
	CO	carbon monoxide	(not monocarbon monoxide)
	CO_2	carbon dioxide	
	SO_3	sulfur trioxide	
	SCl_2	sulfur dichloride	
	SF_6	sulfur hexafluoride	
	N_2S_5	dinitrogen pentasulfide	(because the first element is not
	P_4O_6	tetrasulfur hexaoxide	mono, we specify using the
	N_2O	dinitrogen monoxide	prefixes)
	BrF_5	bromine pentafluoride	

Naming acids. Memorize the list of acids from the flashcards. These include hydrochloric acid, HF(aq), hydrofluoric acid, HCl(aq), hydrobromic acid, HBr(aq) and hydroiodic acid, HI(aq). With the oxygen-containing acids (oxyacids), there is a "similarity" between the acid name and the anion name. Acids named with an –ous ending match anions named with an –ite ending, and acids named with an –ic ending match anions named with an –ate ending.

Acid name	**Anion name:**
H_2SO_3, sulfurous acid	SO_3^{2-}, sulfite
H_2SO_4, sulfuric acid	SO_4^{2-}, sulfate
HClO, hypochlorous acid	ClO^-, hypochlorite
$HClO_2$, chlorous acid	ClO_2^-, chlorite
$HClO_3$, chloric acid	ClO_3^-, chlorate
$HClO_4$, perchloric acid	ClO_4^-, perchlorate