Polyatomic Ions

Polyatomic ions contain two or more different atoms (polyatomic means "many atoms"). Here are some common examples:

a. **ammonium ion, NH_4^+** (the only positive polyatomic ion you need to know)

b. **"ATE" ions:** contain an atom bonded to several oxygen atoms:

Nitrate = NO_3^- Phosphate = PO_4^{3-} Sulfate = SO_4^{2-}
Carbonate = CO_3^{2-} Acetate = $CH_3CO_2^-$ Chlorate = ClO_3^-

c. **"ITE" ions:** remove one oxygen from the "ATE" ion and keep the same charge:

Nitrite = NO_2^- Phosphite = PO_3^{3-} Sulfite = SO_3^{2-}
Chlorite = ClO_2^-

d. **Other common complex ions**:

Hydroxide = OH^- Cyanide = CN^-

Ionic Compounds Containing Polyatomic Ions

As you've already learned, ionic compounds are formed by the combination of **a positive ion** (cation) and a **negative ion** (anion). This is the same when dealing simple ions or complex ions. Be careful to note, however, that complex ions are **grouped together** and should not be separated. In other words, don't ever separate the sulfate ion, SO_4^{2-} into sulfur and oxygen. **If it's written as a group, keep it as a group!**

Since complex ions come in groups, things can get tricky when using subscripts. As a result, we use **parentheses** to separate the ion from the subscript:

If we need two sulfates in a compound, we write: $(SO_4)_2$.
If we need three nitrates in a compound, we write: $(NO_3)_3$.

And, just as before, the **net charge** of the compound must be **zero**. For a salt containing sodium ion, Na^+, and nitrate, NO_3^-, the ratio would be 1:1 since the positive and negative charges cancel out. Therefore, the formula is $NaNO_3$ and is called sodium nitrate. (Note: no parentheses are necessary here).

For a salt containing calcium ion, Ca^{2+}, and nitrate, NO_3^-, the ratio must be 1:2 (one calcium ion for every two nitrates). So, the formula would be **$Ca(NO_3)_2$.**

Nomenclature Worksheet 3:
Ionic Compounds Containing Polyatomic Ions

Please complete the following table:

Name of Ionic Compound	Formula of Ionic Compound
1. Sodium chromate	
2. Calcium carbonate	
3. Magnesium nitrate	
4. Aluminum sulfate	
5. Lithium phosphate	
6. Ammonium chloride	
7. Cesium chlorate	
8. Potassium sulfate	
9. Barium acetate	
10. Rubidium cyanide	
11.	KCH_3CO_2
12.	$Mg_3(PO_4)_2$
13.	$Al(ClO_3)_3$
14.	$CaSO_4$
15.	$Sr(HCO_3)_2$
16.	$NaNO_3$
17.	Li_2CO_3
18.	$Ba(NO_3)_2$
19.	Cs_2CrO_4
20.	NH_4OH