

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^-
Carbonate = CO_3^{2-}

Phosphate = PO_4^{3-}
Acetate = CH_3CO_2^-

Sulfate = SO_4^{2-}
Chlorate = ClO_3^-

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

Nitrite = NO_2^-
Chlorite = ClO_2^-

Phosphite = PO_3^{3-}

Sulfite = SO_3^{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: $(\text{SO}_4)_2$.

If we need three nitrates in a compound, we write: $(\text{NO}_3)_3$.

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 **$\text{Ca}(\text{NO}_3)_2$** .

Writing Ionic Formulas - Polyatomic Compounds

Fill in the correct symbols and charges of the ions and then write the correct formulas in the corresponding boxes.

<u>IONS</u>	carbonate	nitrite	sulfate	phosphate	chlorite	hydroxide
sodium						
beryllium						
aluminum						
hydrogen						
strontium						
barium						
potassium						
magnesium						