# Oxidation state (number) assignment rules

**Name: _____**

1. The oxidation number of an uncombined atom (or atoms in a diatomic molecule) is zero.

2. In monatomic ion the oxidation number of the atom is the charge on the ion.

3. The sum of the oxidation number of atoms in a compound is zero.

4. The sum of oxidation numbers in a complex or polyatomic ion equals the charge on the ion.

5. Some elements have fixed oxidation numbers in all or most of their compounds and using these oxidation state of other atoms in a compound (whether ionic or covalent) can be determined. And they are:

| Metals | | Non-metals |
|---|---|---|
| Group IA metals | +1 | hydrogen +1 (exception: metal hydrides in which it is -1) |
| Group IIA metals | +2 | fluorine -1 |
| | | Other halogens (Cl, Br, I) -1 (exception: with oxygen and other halogens) |
| Aluminum | +3 | oxygen -2 (exceptions: peroxides (-1) ; superoxides, which you do not need to be able to remember; and with fluorine) |

A peroxide is a compound containing a bond between two oxygen in addition to the other bond(s). (Name derived from the "peroxodo" unit with the formula $O_2^{2-}$.) For example, $H_2O_2$, $Na_2O_2$, $BaO_2$. You'll need to remember only hydrogen peroxide, $H_2O_2$.

## Polyatomic Ions and oxidation states

| Formula | common name | systematic name | oxidation states (numbers) |
|---|---|---|---|
| $NH_4^+$ | ammonium | ammonium | |
| $HCO_3^-$ | bicarbonate | hydrogen carbonate | |
| $ClO^-$ | hypochlorate | chlorate(I) | |
| $ClO_2^-$ | chlorite | chlorate(III) | |
| $ClO_3^-$ | chlorate | chlorate(V) | |
| $ClO_4^-$ | perchlorate | chlorate(VII) | |
| $MnO_4^-$ | permanganate | manganate(VII) | |
| $NH_2^-$ | amide | amide | |
| $NO_2^-$ | nitrite | nitrite | |
| $NO_3^-$ | nitrate | nitrate | |
| $OH^-$ | hydroxide | hydroxide | |
| $H_3O^+$ | hydronium | oxonium | |
| $HSO_3^-$ | hydrogen sulfite | hydrogen sulfite | |
| $HSO_4^-$ | hydrogen sulfate | hydrogen sulfate | |
| $SO_3^{2-}$ | sulfite | sulfite | |
| $SO_4^{2-}$ | sulfate | sulfate | |
| $S_2O_3^{2-}$ | thiosulfate | thiosulfate | |
| $CO_3^{2-}$ | carbonate | carbonate | |
| $C_2O_4^{2-}$ | oxalate | ethandioate | |
| $CrO_4^{2-}$ | chromate | chromate(VI) | |
| $Cr_2O_7^{2-}$ | dichromate | dichromate(VI) | |
| $H_2PO_4^-$ | dihydrogen phosphate/phosphate(V) | | |
| $HPO_4^{2-}$ | monohydrogen phosphate/phosphate(V) | | |
| $PO_4^{3-}$ | phosphate | phosphate/phosphate(V) | |
| $PO_3^{3-}$ | phosphite | phosphite/phosphate(III) | |