Rules for Assigning Oxidation States

1. The oxidation state of an atom in any neutral monatomic form is zero; for example, the oxidation states for the following are all 0: Cu, Ag, N_2, and O_3.
2. The oxidation state of a monatomic cation or anion is the same as the ion's charge; thus, Na^+ has a +1 oxidation state and Cl^- has a –1 oxidation state
3. The algebraic sum of oxidation states for the elements in a polyatomic compound or ion must equal the compound's or ion's total charge; for example:
   - for CH_4 the oxidation state of C × 4 + oxidation state of H is 0
   - for NO_3^-, the oxidation state of N × 3 + oxidation state of O is –1
4. When more than one element is present, the more electronegative element maintains the negative oxidation state; thus:
   - in CH_4, carbon has a negative oxidation state
   - in NO_3^-, oxygen has a negative oxidation state
5. There are a few elements that have only one or two common non-zero oxidation states; these are:
   - hydrogen is always +1 when bound to a more electronegative element, such as in HCl or CH_4, and –1 when bound to a less electronegative element, such as in NaH
   - alkali metals are always +1
   - alkaline earths are always +2
   - oxygen is usually –2, but it is –1 in peroxide, O_2^{2-}, and it is $-\frac{1}{2}$ in superoxide, O_2^-
6. Other oxidation states are determined by applying these rules; thus:
   - the P in PO_4^{3-} is +5
   - the P in PCl_3 is +3
   - the P in PH_3 is –3