

Section 17.1

Review of Redox Chemistry



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Learning Objectives



- Describe defining traits of redox chemistry
- Identify the oxidant and reductant of a redox reaction
- Balance chemical equations for redox reactions using the half-reaction method

Oxidation Numbers



- A redox reaction entails changes in **oxidation number** for one or more of the elements.
- The oxidation number of an element in a compound is essentially an assessment of how the *electronic environment of its atoms is different in comparison to atoms of the pure element*.
 - The oxidation number of *an atom in an element is equal to zero*.
 - For an atom in a compound, the oxidation number is equal to the *charge the atom would have in the compound if the compound were ionic*.
- The sum of oxidation numbers for all atoms in a molecule is equal to the charge on the molecule.

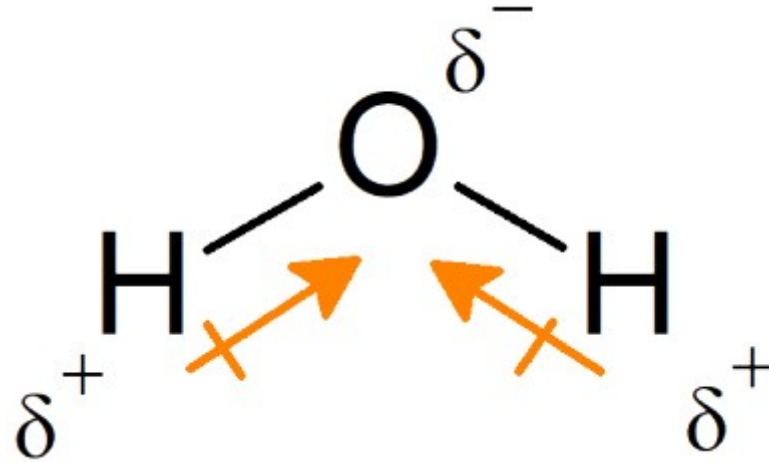
Oxidation Number of Ionics



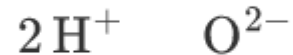
Oxidation Number Ca = +2

Oxidation Number F = -1

Covalent Oxidation Numbers

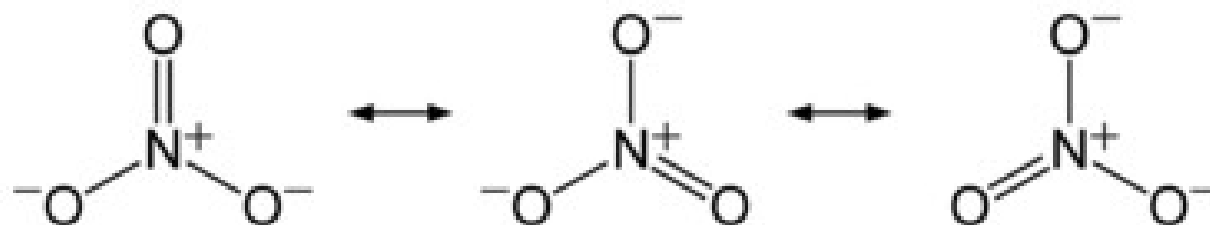


If it were ionic



Oxidation Number H = +1

Oxidation Number O = -2



$$(1 \text{ N atom}) \left(\frac{+5}{\text{N atom}} \right) + (3 \text{ O atoms}) \left(\frac{-2}{\text{O atom}} \right) = +5 + -6 = -1$$

Balancing Redox Reactions



- 1) Write skeletal equations for the oxidation and reduction half-reactions.
- 2) Balance each half-reaction for all elements except H and O.
- 3) Balance each half-reaction for O by adding H_2O .
- 4) Balance each half-reaction for H by adding H^+ .
- 5) Balance each half-reaction for charge by adding electrons.
- 6) If necessary, multiply one or both half-reactions so that the number of electrons consumed in one is equal to the number produced in the other.
- 7) Add the two half-reactions and simplify.
- 8) If the reaction takes place in a basic medium, add OH^- ions the equation obtained in step 7 to neutralize the H^+ ions (add in equal numbers to both sides of the equation) and simplify.