From left to right on the periodic table, **acid-base character of oxides and hydroxides** go from basic to acidic.

- Increasing charge on an anion increases the production of basic solutions.
- As electronegativity increase, production of ionic cations increases because elements are more able to adopt a cation.
- As ionization energy increases, the acidic nature increases.

### Metallic Oxides:

- Ionic Bonding: no distribution of electron wave function
- Ionic oxides are usually basic (element act as a base when reacting with H2O)

\[
\text{Na}_2\text{O(s) + H}_2\text{O(l)} \rightarrow 2\text{NaOH(aq)} \rightarrow 2\text{Na}^+(aq) + 2\text{OH}^-(aq)
\]

B. Oxide B. Hydroxide

### Semimetal Oxides:

- Semimetal are amphoteric (elements acts as an acid and/or base when reacting depending on pH of solution)

\[
\text{Al}_2\text{O}_3 \rightarrow \text{Al(OH)}_3 \rightarrow (3\text{H}^+) \rightarrow [\text{Al(H}_2\text{O)}_6]^3+ (aq)
\]

\[
\rightarrow (\text{OH}^-) \rightarrow [\text{Al(OH)}_4]^- (aq)
\]

### Non-Metal Oxides

- Covalent Bonding: almost complete distribution of electron wave function
- Covalent oxides are usually acidic (elements act as an acid when reacts with H2O)

\[
\text{SO}_3 + \text{H}_2\text{O(l)} \rightarrow \text{H}_2\text{SO}_4(aq) \rightarrow \text{H}^+ + \text{HSO}_4^-
\]

A. Oxide A Hydroxide
Ionic Hydrides

Types of Hydrides

- Ionic Bonding: no distribution of electron wave function
- Bronsted Basic because they will react with proton
- Lewis Basic because they can be ligands

\[ \text{CaH}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{Ca(OH)}_2 \]

H- H+ H2

- In this case, CaH2 is basic because it reacts with water (an acid in this case) to form many hydrides by reducing a proton.

Covalent Hydrides

- Covalent Bonding: almost complete distribution of electron wave function

\[ \text{HF} + \text{H}_2\text{O} \rightarrow \text{F}^- + \text{H}_3\text{O}^+ \ldots \text{can also be written as HF(aq) <---> H}^+(\text{aq}) + \text{F}^-(\text{aq}) \]

H+ H+ H+

- HF is a weak acid that is bronsted acid because it will loose a proton. Therefore, HF is the weak acid, where the water acts as a silent water, and F- is the weak conjugate base.
Contributors

- Template:ContribChem230