BRONSTED-LOWRY THEORY OR ACIDS AND BASES

- Johannes Bronsted and Thomas Lowry independently focused on the role of an acid or a base in a reaction rather than of the properties on their aqueous solutions.
  - defines an acid as a proton donor
  - defines a base as a proton acceptor

Example:

\[
\text{HCl}_{\text{aq}} + \text{H}_2\text{O}_{\text{l}} \rightarrow \text{H}_3\text{O}^+_{\text{aq}} + \text{Cl}^-_{\text{aq}}
\]

\[
\text{NH}_3_{\text{aq}} + \text{H}_2\text{O}_{\text{l}} \rightarrow \text{NH}_4^+_{\text{aq}} + \text{OH}^-_{\text{aq}}
\]

- A substance can only be described as a Bronsted-Lowry acid or a base for a specific reaction NOT as a general property of the substance.
Substances capable of reacting as an acid in one reaction and a base in another reaction are referred to as AMPHIPROTIC.

Example:

$$\begin{align*}
\text{H}^+_{(aq)} & \quad \text{HCO}_3^-_{(aq)} + \text{H}_3\text{O}^+_{(aq)} \rightarrow \text{H}_2\text{O} \ (l) + \text{H}_2\text{CO}_3(aq) \\
\text{Base} & \quad \text{Acid}
\end{align*}$$

$$\begin{align*}
\text{H}^+_{(aq)} & \quad \text{HCO}_3^-_{(aq)} + \text{OH}^-_{(aq)} \rightarrow \text{H}_2\text{O} \ (l) + \text{CO}_3^-_{(aq)} \\
\text{Acid} & \quad \text{Base} \quad \text{Conjugate Base}
\end{align*}$$

When a proton is removed from a Bronsted-Lowry acid, the product formed is referred to as the acid’s conjugate base.

When a proton is gained by a Bronsted-Lowry base, the product formed is referred to as the base’s conjugate acid.

<table>
<thead>
<tr>
<th>Conjugate Acid</th>
<th>Conjugate Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{H}_2\text{O} \ (l)$</td>
<td>$\text{OH}^-_{(aq)}$</td>
</tr>
<tr>
<td>$\text{H}<em>3\text{O}^+</em>{(aq)}$</td>
<td>$\text{H}_2\text{O} \ (l)$</td>
</tr>
<tr>
<td>$\text{NH}<em>4^+</em>{(aq)}$</td>
<td>$\text{NH}_3 \ (aq)$</td>
</tr>
</tbody>
</table>

According to the Bronsted-Lowry theory, in a neutralization reaction a proton is transferred from the strongest acid to the strongest base.