Chapter 2

Conversion
1. Conversion

Conversion is defined as the moles of a species reacted \((N_{i0} - N_i)\) divided by the moles fed \((N_{i0})\).

\[ X_i = \frac{N_{i0} - N_i}{N_{i0}} \]

For the reaction

\[ A \rightarrow B \]

the conversion with respect to A is given by

\[ X_A = \frac{N_{A0} - N_A}{N_{A0}} = \frac{F_{A0} - F_A}{F_{A0}} = \frac{C_{A0} - C_A}{C_{A0}} \quad (1) \]

It doesn't matter which measure of A is used, the conversion will be the same. The conversion is always a number between zero and one. If we take the first expression for the conversion and solve it for \(N_A\)

\[ X_A = \frac{N_{A0} - N_A}{N_{A0}} \]

\[ N_A = N_{A0} - N_{A0} X \]

\[ N_A = N_{A0} (1 - X) \quad (2) \]

It is obvious from Equation 1 that the same transformations could be made to solve for \(C_A\) and \(F_A\).
**Example:** Calculate the conversion of A in the reaction $A \rightarrow B$ if $C_{A0} = 2.7 \text{ mole/liter}$ and $C_A = 0.75 \text{ mole/liter}$.

$$X_A = \frac{C_{A0} - C_A}{C_{A0}}$$

$$X_A = \frac{2.7 - 0.75}{2.7}$$

$$X_A = 0.72$$

**Exercise:** Calculate the conversion for the following

<table>
<thead>
<tr>
<th>Variable</th>
<th>Initial</th>
<th>Final</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>10 mole/min</td>
<td>1 mole/min</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2 mole</td>
<td>0.1 mole</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4 mole/liter</td>
<td>1.5 mole/liter</td>
<td></td>
</tr>
</tbody>
</table>

Clicking on **Solution** will provide the solutions. Clicking on the previous view arrow will return to this page.