Adiabatic temperature

The gas stream coming from the reformer unit is fed to a reactor where CO is converted to CO2 and H2 by means of the water gas shift (WGS) reaction:

CO + H2O ↔ CO2 + H2

The inlet gas stream is at 360 °C and 30 bar. The pressure drop across the reactor is negligible and the reactor is adiabatic.

By considering that a conversion of CO equal to 70% is achieved, evaluate the temperature and the composition of the stream leaving the reactor.



**DATA**:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Specie** | **mol/mol [%]** | **(298K)**  **[Cal/mol]** | **a** | **b \* 103** | **c \* 106** | **d \* 109** |
| **H2** | 34.8 | 0 | 6.483 | 2.215 | -3.298 | 1.826 |
| **CO** | 7.5 | -26420 | 7.373 | -3.070 | 6.662 | -3.037 |
| **CO2** | 5.0 | -94050 | 4.728 | 17.54 | -13.38 | 4.097 |
| **CH4** | 0.6 | -17890 | 4.598 | 12.450 | 2.860 | -2.709 |
| **H2O** | 37.9 | -57800 | 7.701 | 0.4595 | 2.521 | -0.859 |
| **N2** | 14.2 | 0 | 7.44 | -3.24 | 6.4 | -2.79 |

**Theory:**