Example

Air at $T_a = 77^\circ C$, $P_a = 1$ bar and molar flow rate of $\dot{n}_a = 0.1$ kmol/s enters an insulated mixing chamber. It mixes with water vapor at $T_w = 277^\circ C$, $P_w = 1$ bar and molar flow rate of $\dot{n}_w = 0.3$ kmol/s, with the mixture exiting at $P_{mix} = 1$ bar. If both air and water can be modeled as ideal gases with variable specific heats,

(a) find the temperature of the exiting mixture $T_{mix}$ and
(b) the rate of entropy generation in the mixture.
(c) What is the source of entropy generation?