Chemical Thermodynamics
Examples

- Consider a simple gas phase equilibrium
  \[ \text{N}_2\text{O}_4 \leftrightarrow 2 \text{NO}_2 \]
- What is \( K_p \) at equilibrium assuming that the gases are ideal and \( T = 298 \text{K} \)?
Examples

- Consider a simple gas phase equilibrium
  \[ \text{N}_2\text{O}_4 \leftrightarrow 2 \text{NO}_2 \]
- If one mole of N\(_2\)O\(_4\) is placed in a 10 L tank at 298 K how much of each species is present at equilibrium?
Examples

- Consider a simple gas phase equilibrium
  \[ \text{N}_2\text{O}_4 \leftrightarrow 2 \text{NO}_2 \]
  
- If one mole of N$_2$O$_4$ is placed in a balloon such that the total pressure is always 1 bar at 298 K how much of each species is present at equilibrium?
Examples

- Consider a simple gas phase equilibrium
  \[ \text{N}_2\text{O}_4 \leftrightarrow 2 \text{NO}_2 \]
- If one mole of \( \text{N}_2\text{O}_4 \) is placed in a balloon such that the total pressure is always 1 bar at 400 K how much of each species is present at equilibrium?
Examples

Consider a hypothetical gas phase reaction

\[ A \ (g) + B \ (g) \rightleftharpoons C \ (g) \]

The reaction is conducted at constant temperature and the gases are ideal. The standard chemical potentials at 298 K of C(g), A(g), and B(g) are -12 kJ/mol, -3 kJ/mol, and -4 kJ/mol, respectively. What is \( K_p \) for the reaction at 298K?
Examples

Consider a hypothetical gas phase reaction

\[ A \ (g) + B \ (g) \leftrightarrow C \ (g) \]

The reaction is conducted at constant temperature and volume and the gases are ideal. The standard chemical potentials at 298 K of C(g), A(g), and B(g) are -12 kJ/mol, -3 kJ/mol, and -4 kJ/mol, respectively. What is the volume if 1 mole of each substance is present at equilibrium?