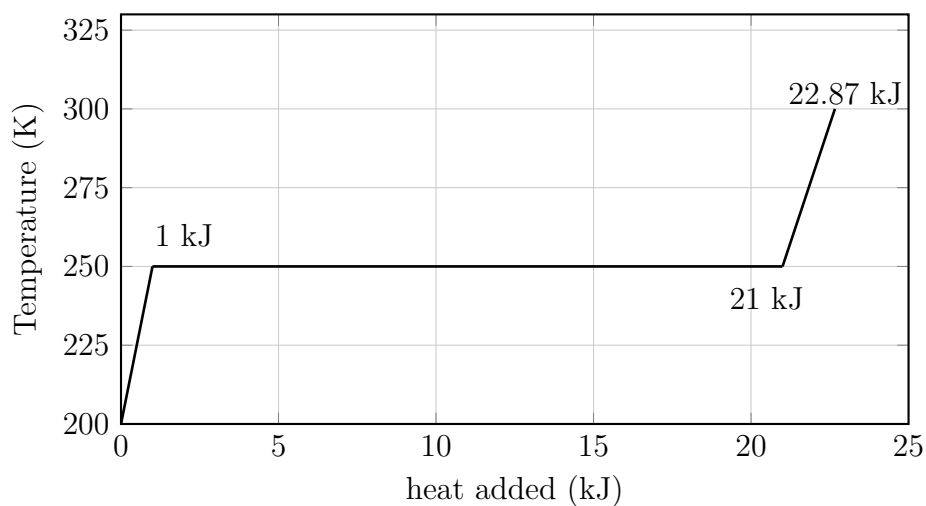


1. One mole of a fictitious element Hamiltonian is heated under constant pressure. Hamiltonian has $m_p = 200\text{ K}$ and $b_p = 250\text{ K}$.



- (a) What is ΔH_{vap} of Hamiltonian?
- (b) Assume Hamiltonian acts as an ideal gas. What can you infer about the number of atoms and the molecular structure (linear vs non-linear)?
- (c) What is the entropy change associated with just the vaporization and heating to 300 K?

2. The goal of this problem is to calculate S_m° of gaseous acetone.

Property	Value
\overline{C}_p (acetone, liquid)	$125.5 \frac{\text{J}}{\text{K}\cdot\text{mol}}$
\overline{C}_p (acetone, gas)	$75 \frac{\text{J}}{\text{K}\cdot\text{mol}}$
$\Delta H_{\text{vap}}^\circ$ (acetone)	$29.1 \frac{\text{kJ}}{\text{mol}}$
S_m° (acetone, liquid)	$200 \frac{\text{J}}{\text{K}\cdot\text{mol}}$
T_m (acetone)	178 K
T_b (acetone)	329.4 K

(a) Find the ΔS for heating 1 mol of liquid acetone from 298 K to 329.4 K.

(b) Find the ΔS for vaporizing 1 mol of liquid acetone at 329.4 K.

(c) Find the ΔS associated with cooling 1 mol of gaseous acetone from 329.4 K to 298 K, disregarding any phase changes.

(d) Determine S_m° of gaseous acetone.

3. A closed, rigid 2.5 L flask contains a mixture of Ne(g) and F₂(g) with a total pressure of 3.32 atm at 0 °C. The system is heated to 15 °C. The change in entropy for this process is $0.345 \frac{\text{J}}{\text{K}}$. What is the mole fraction of Ne in the flask, X_{Ne} ?

Homework Problem 17

1. A 1 mol sample of CH₄ at 298 K and 24.5 atm is contained in a 1 L closed, flexible container. The gas undergoes expansion to 2 L. In order to maintain a zero change in entropy ($\Delta S = 0$) during the expansion, what must the final temperature and pressure of the sample be?