

Statistical Mechanics

Worksheet 4

May 11th, 2023

6. Free Energy

A substance has the following properties

- At a constant temperature T_0 the work done by it on expansion from V_0 to V is

$$W = RV_0 \log \left(\frac{V}{V_0} \right) \quad (1)$$

- The entropy is given by

$$S = R \frac{V_0}{V} \left(\frac{T}{T_0} \right)^a \quad (2)$$

Where V_0 , T_0 and a are fixed constants.

1. Calculate the Helmholtz free energy.
2. Find the equation of state
3. Find the work done at an arbitrary constant temperature T