Boltzmann's constant $k_B = 1.38 \times 10^{-23}$ J/K
Avogadro's number $N_A = 6.022 \times 10^{23}$ mol^{-1}
Real gas constant $R = 8.314$ J/K.mol

Specific heat of liquid H_2O = 4.18 J/gK
Latent heat of the liquid-solid transition for H_2O = 333 J/g
Latent heat of the liquid-gas transition for H_2O = 2270 J/g
Adiabatic constant for N_2 g = 1.4
Specific heat at constant pressure for N_2 C_P = 29.12 J mol^{-1} K^{-1}
Specific heat at constant pressure for N_2 C_V = 20.8 J mol^{-1} K^{-1}
Molar mass of air = 29 g/mol

Partial derivatives

$$\left(\frac{\partial x}{\partial y}\right)_z \left(\frac{\partial y}{\partial z}\right)_x \left(\frac{\partial z}{\partial x}\right)_y = -1 \; ; \quad \left(\frac{\partial y}{\partial x}\right)_z = \frac{1}{\left(\frac{\partial x}{\partial y}\right)_z} \; ; \left(\frac{\partial y}{\partial x}\right)_z = -\frac{\left(\frac{\partial z}{\partial x}\right)_y}{\left(\frac{\partial z}{\partial y}\right)_x}$$

Thermodynamic quantities

$$\kappa_T = \frac{-1}{V}\left(\frac{\partial V}{\partial P}\right)_T$$ Isothermal compressibility

$$\beta = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_P$$ Expansivity

$$\kappa_S = \frac{-1}{V}\left(\frac{\partial V}{\partial P}\right)_S$$ Adiabatic compressibility

$$c_V = \frac{1}{n}\left(\frac{\partial U}{\partial T}\right)_V$$

$$c_P = \frac{1}{n}\left(\frac{\partial U}{\partial T}\right)_P + \frac{P}{n}\left(\frac{\partial V}{\partial T}\right)_P$$

Thermodynamic potentials

F=U-TS	*dF=-SdT-PdV*	Helmholtz Free Energy
H=U+PV	*dH=TdS+VdP*	Enthalpy
G=U-TS+PV	*dG=-SdT+VdP*	Gibbs Free Energy

Ideal gas

PV=NkT

$$U = \frac{1}{\gamma - 1} NkT$$

$PV^{\gamma} = const$ for Adiabatic process

Efficiency of Carnot cycle

$$\eta = \frac{W_{cycle}}{Q_{in}} = 1 - \frac{T_c}{T_h}$$