Formula Sheet

$pv = RT$

where R is the specific gas constant

$g = -\frac{1}{\rho}\frac{\partial p}{\partial z}$ $dw = -pdv$ $du = dq + dw$

For an ideal gas: $du = c_V\, dT$ $dh = c_p\, dT$ $c_p - c_v = R$

$ds = dq_{rev}/T$

1 cm^3 = 0.1 J/bar

R^* = 8.3144 J/°K mol

G = 9.81 m s^{-2}

1 atm = 10^5 Pa

1 atm = 1.013×10^5 Pa

1 bar = 1 atm.

1 Pa = N/m^2

1 N = J/m

dG = -SdT + VdP

Molar mass of Air = 29 x 10^{-3} kg/mol

c_p of air = assume it is an ideal gas composed of molecues with 5 degrees of freedom.

K = °C + 273.15

Ideal Gas Law PV = nRT

Carnot Heat Engine is $\eta = 1 - \frac{T_{cold}}{T_{hot}}$.

System Gibbs Free Energy with droplets: $G = n_g g_g + n_l g_l + 4\pi R_p^2 \sigma$

Kelvin Equation: $\frac{e_s^{curved}}{e_s^{flat}} = \exp\left(\frac{4M_w\sigma}{RT\rho_w D_p}\right)$, where σ is the surface tension of water (=0.072 J m^{-2}), ρ_w is the density of water (=1000 kg m^{-3}), M_w is the molar mass of water and D_p is the droplet diameter.

$\mu_{H2O(l)} = \mu^*_{H2Opure(l)}(T) + RT\ln(\chi_w\gamma_w)$ $\mu_{H2O(g)} = \mu^\dagger_{H2Opure(g)}(T) + RT\ln(y_w P)$

Raoult's Law: $P = P^{sat}(T)\, \chi_w\gamma_w$