

CHEM2011 office hours notes

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Test 1 notes

Terminology and cases

- **Isothermal** $\implies T \equiv \text{const} \implies w = -nRT \ln\left(\frac{V_2}{V_1}\right) = -nRT \ln\left(\frac{P_1}{P_2}\right)$
- **Isobaric** $\implies P \equiv \text{const} \implies w = -P\Delta V$
- **Isochoric** $\implies V \equiv \text{const} \implies w = 0, q = 0$
- **Adiabatic** $\implies q = 0 \implies \Delta U = w \implies T_1 P_1^{\frac{1-\gamma}{\gamma}} = T_2 P_2^{\frac{1-\gamma}{\gamma}}$

Definition of a state function and constants

- A function $f(x, y)$ is a state function if and only if the following property is satisfied::

$$\left(\frac{\left(\frac{\partial f}{\partial x} \right)_y}{\partial y} \right)_x = \left(\frac{\left(\frac{\partial f}{\partial y} \right)_x}{\partial x} \right)_y$$

- For monoatomic gases, $\bar{C}_V = \frac{3}{2}R$, $\bar{C}_P = \frac{5}{2}R$, $\gamma = \frac{\bar{C}_P}{\bar{C}_V} = \frac{5}{3}$
- For diatomic gases (assume no vib.), $\bar{C}_V = \frac{5}{2}R$, $\bar{C}_P = \frac{7}{2}R$, $\gamma = \frac{\bar{C}_P}{\bar{C}_V} = \frac{7}{5}$