Summary of Processes for Ideal Gas:

**Isochoric**

\[ \Delta U = \frac{f}{2} P (V_f - V_i) \]

\[ \frac{f}{2} \frac{N k_B (T_f - T_i)}{V_i} \]

**Isothermal**

\[ \Delta U = -N k_B T \ln \left( \frac{V_f}{V_i} \right) \]

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**Isentropic**

\[ \Delta U = -W_{iso} = \Delta W_{by} \]

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**Adiabatic**

\[ \Delta U = -N k_B \frac{V_f - V_i}{T_f} \]

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**Polytropic**

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