Type of process	Associated formula	Miscellaneous note
Reversible process	$\delta W = P\,dV$ $\delta Q = T\,dS$ $\Delta S = \int \delta Q/T$	- The total entropy change of the system and its surrounding must be zero - However, the entropy of the system ***by itself*** can change - A reversible process has the minimum possible entropy increase for a given δQ (recall the 2nd law of thermodynamics) - The entropy change of a system undergoing a reversible ***cycle*** is zero
Quasistatic process	-	- A process that happens infinitely slowly, so that each instant the system is in thermodynamic equilibrium - Reversible processes are always quasistatic, but a quasistatic process need not to be reversible in general
Adiabatic process	$\delta Q = 0$	- No heat is exchanging between a system and its surroundings
Isentropic process/ Reversible adiabatic process	$PV^{\gamma} = \text{constant}$ $\gamma = C_P/C_V$	- Both idiomatic and reversible ⇔ zero entropy change (entropy change of the system itself is zero, and therefore the entropy change of the surroundings is zero as well) - An isentropic process is a process with zero entropy change
Iso-something process	- For isothermal process $P = Nk_BT/V$ $\Rightarrow W = \int P\,dV = Nk_BT \int dV/V$ - For isochoric process $dV = 0$	- Isothermal ⇒ constant temperature - Isobaric ⇒ constant pressure - isochoric ⇒constant volume
Free expansion	$PV = P'V'$ $\Delta U = 0$ $Q = 0$ $W = 0$	- The temperature does not change during free expansion - Is adiabatic, but not reversible - The fact that it's reversible means that there is an entropy change even though $\delta Q = 0$ (and therefore the previously mentioned formula $\Delta S = \int \delta Q/T$ does not hold here) - Even thought the gas expands, ***it does no work***