4.9: Summary of Major Ensembles

	boundary	variables	probability of microstate	p.f.	master function
microcanonical	adiabatic (no-skid)	E, V, N	$\frac{d\Gamma}{N! h_0^{3N}} \frac{1}{\Omega}$ or 0	Ω	$S(E, V, N) = k_B \ln \Omega$
canonical	heat bath	T, V, N	$\frac{d\Gamma e^{-\beta H(\Gamma)}}{N! h_0^{3N}} \frac{1}{Z}$	Z	$F(T, V, N) = -k_B T \ln Z$
grand canonical	heat bath, with holes	T, V, μ	$\frac{d\Gamma_N e^{-\beta H(\Gamma_N) - \alpha N}}{N! h_0^{3N}} \frac{1}{\Xi}$	Ξ	$\Pi(T, V, \mu) = -k_B T \ln \Xi$

In all cases, the partition function (p.f. in the above table) is the normalization factor

$$\text{p. f.} = \sum_{\text{microstates}} \text{unnormalized probability.} \tag{4.9.1}$$