

$$g(N, s) = \frac{N!}{\left(\frac{1}{2}N + s\right) \left(\frac{1}{2}N - s\right)} = \frac{N!}{N_{\uparrow}! N_{\downarrow}!}$$

$$U(s) = -2smB$$

$$\sigma(N, s) = \ln(g(N, s))$$

$$S = k_B \sigma$$

Accessible States ( $s = s_1 + s_2$ ) :

$$g(s) = \sum_s g_1(s_1) g_2(s - s_1)$$

$$g(N, s) \approx \sqrt{\frac{2}{\pi N}} 2^N e^{-\frac{2s^2}{N}}$$

$$2s = N_{\uparrow} - N_{\downarrow}$$

$$\frac{1}{\tau} = \left( \frac{\partial \sigma}{\partial U} \right)_{N, V}$$

$$\tau = k_B T$$