2.27 From Eqn. 2.41, we know that the multiplicity of an ideal gas is given by
\[ \Omega(U, V, N) = f(N)V^N U^{3N/2}. \]
With the other variables held constant, we can see that if 1% of the volume is not used, its multiplicity is down by a factor of \((0.99)^N\), with respect to the multiplicity of the full volume.

Plugging in some numbers, we see that for \(N = 100\), \((0.99)^{100} = 0.37\). So, the condition that the leftmost 99% of the volume contained all of the molecules occurs over 1/3 of the time.

For \(N = 10,000\) though, \((0.99)^{10000} = 2.3 \times 10^{-44}\). So, the odds that the leftmost 99% contained all of the molecules would be vanishingly small.

For \(N = 10^{23}\), \((0.99)^{10^{23}} = (10 \log_{10} 0.99)^{10^{23}} = \left(10^{-4.36 \times 10^{-3}}\right)^{10^{23}} = 10^{-4.36 \times 10^{23}}\). So, that the rightmost 1% of the volume would be unoccupied would be unimaginably rare.