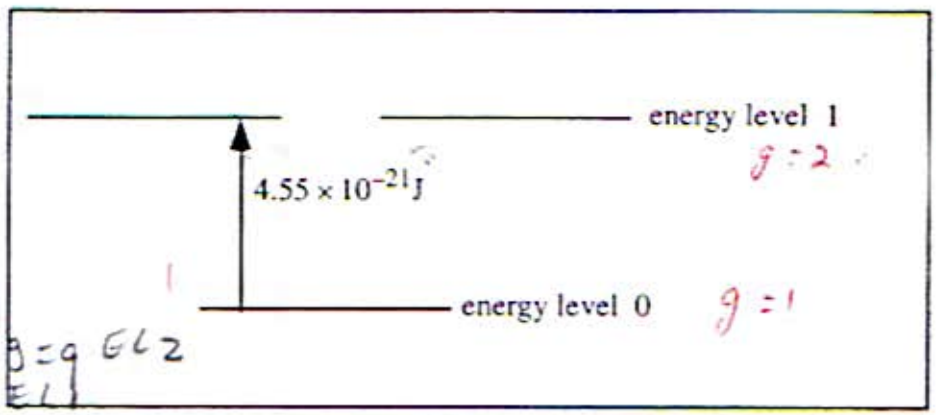
Information 50:50 explanation

At infinite temperature there is sufficient energy available such that the molecules will simply populate all energy states without regard to energy. If there are 10 states, all will be equally occupied at $T = \infty$ K.

Exercises

1. For one mole of molecules, find the number of molecules in state 0 and state 1 at $T = 0$, 300, and ∞ K for the following system. Note that energy level 1 is two-fold degenerate.



two states
g = 2
g = 1
# of states that have

2. A system has three energy levels: ε_0, ε_1, and ε_2. The degeneracies of these energy levels are as follows: $g_0 = 2$; $g_1 = 1$; $g_2 = 9$. If one mole of molecules are placed into the system at $T = \infty$ and allowed to come to thermal equilibrium, how many molecules will be found in the ε_0 energy level?

equally populated

3 energy levels

$$\frac{N_x}{N_0} = \frac{g_x}{g_0} e^{-\frac{(E_x - E_0)}{kT}} \quad T \to \infty$$

$$\frac{N_0}{N_1} = \frac{2}{1} \left(\frac{1}{e^{(\Delta E/kT)}}\right)$$

$$\frac{N_x}{N_0} = \frac{g_x}{g_0} \frac{1}{e^{\infty}} = 0$$

1) T = 0 all in ELO — 0 molec. in the first EL

T = 300 ratio 0.33 = 2/3 — 33/100 = x/(6.02×10^23 − x)

T = ∞ ratio 1 — 50:50 — 1/2 molecules