1. A regular solution has excess entropy of zero but an excess enthalpy that is non-zero and dependent on the composition. We can think of a regular solution as one in which the different molecules of the solution are distributed randomly, an in an ideal solution, but have different energies of interaction with each other. The parameter ξ is a measure of the difference between A-B interactions and A-A interactions. If ξ<0, A-B interactions ate energetically more favourable than A-A interactions; in this case mixing is exothermic and even more spontaneous in all proportions than for an ideal solution. If, on the other hand, ξ>0, A-B interactions are energetically les favourable than A-A interactions. In this case, mixing is endothermic.
2. The excess enthalpy in a regular solution is

The maximum excess enthalpy occurs at *x*A=*x*B=1/2.

Using the Margules equations we can take the natural log of the activity coefficients;

 and

Because *x*A=*x*B ln*γ*A=ln*γ*B=1.31(0.500)2=0.328 and *γ*A=*γ*B=1.39

Finally, *a*A=*x*A*γ*A=0.5001.39=0.694=*a*B

1. so
2. The time in seconds for a disk to rotate 360° is the inverse of the frequency. The time for it to advance 2° is . This is the time required for slots in neighbouring disks to coincide along the atomic beam. For an atom to pass through all neighbouring slots it must have the speed of .

Theoretically, the velocity distribution in the x-direction is , where

Therefore as , we can write and eliminate the constant of proportionality by taking the ratio of intensities at the two temperatures.

Draw up the following table:

*ν*/Hz 20 40 80 100 120

*Iexp* (40 K) 0.846 0.513 0.069 0.015 0.002

*Iexp* (100 K) 0.592 0.485 0.217 0.119 0.057

{*I* (40 K) /I (100 K)}exp 1.43 1.06 0.32 0.13 0.035

{*I* (40 K) /I (100 K)}calc 1.43 1.07 0.33 0.14 0.047