The magnetic susceptibility is defined as x = M / H Using Eq. (3.2.2), we derive for the magnetic (3.2.3) susceptibility chi = (N*mu_{0} * g ^ 2 * J(J + 1) * mu_{B} ^ 2)/(3kT) = C/T with the Curie constant C given by C = (N*mu_{0} * g ^ 2 * J(J + 1) * mu_{B} ^ 2)/(3k) (3.2.4) Relationship (3.2.3) is known as the Curie's law because it was first discovered experi-mentally by Curie in 1895.Each of these levels will be split by the applied magnetic field into 2J + 1 sublevels.Curie's law states that if the reciprocal values of the magnetic susceptibility, measured at various temperatures, are plotted versus the corresponding tem-peratures, one finds a straight line passing through the origin.With increasing temperature, there would have been an increasing contribu-tion of the sublevels of the excited states to the statistical average if we had included these levels in the summation in Eq. (3.1.4).2.2.3 where the upper full line represents the variation of g * sqrt(J(J + 1)) across the rare-earth series and where the effective moments experimentally observed for the tri-aluminides are given as full circles.(3.2.5) The Curie behavior may be illustrated by means of results of measurements made on the intermetallic compound TmAls shown in Fig.Since, for S m^ 3+ , the excited multiplet levels have higher magnetic moments than the ground state, one expects that M and X will increase with increasing temperature for sufficiently high temperatures.Similar experiments made on most of the other types of rare-earth tri-aluminides also lead to effective moments that agree closely with the values derived with Eq. (3.2.5).Exper-imental results for SmAl3 demonstrating this exceptional behavior are shown in Fig.From the slope of this line one finds a value for the Curie constant C and hence a value for the effective moment mu eff =g sqrt J(J+1) mu B .per Tm atom, which is close to the value expected on the basis of Eq. (3.2.5) with J and g determined by Hund's rules (values listed in Table 2.2.1).In these cases, one needs to take into account only the 2J + 1 levels of the ground-state multiplet, as we did when calculating the statistical average by means of Eq. (3.1.4).At very low temperatures, only the 2J + 1 levels of the ground-state multiplet are populated.Since these levels have not been considered in the derivation of Eq. (3.2.3) via Eq. (3.1.4), one may expect that Eq. (3.2.3) does not provide the right answer here.This means that x ^ - 1 will decrease with increasing temperature, which is a strong violation of the Curie law (.It is seen that the reciprocal susceptibility is linear over almost the whole temperature range.From the slope of this line one derives mu eff =7.68 u?3.2.1 that for S m^ 3+ several excited multiplet levels occur which are not far from the ground state.With increasing temperature, however, the sublevels of the excited states also become populated.In all these cases, one has a situation basically the same as that shown in the inset of Fig.The situation is different, however, for S m^ 3+ and B u^ 3+ It is shown in the inset of Fig.This be seen from Fig.3.2.1 for T m^ 3+ where the ground-state multiplet level lies much lower than the first .excited multiplet level.Note that in the temperature range considered in Fig.3.2.1. 3.2.3).3.2.1