Eq. (15) becomes

$$\frac{d^2\beta}{ds^2} = sI_{1/2}(\beta/s) \tag{17}$$

The boundary condition is

$$d\beta/ds = \beta/s \quad \text{at} \quad s = b \tag{18}$$

where $a = cb$

is the atomic radius. At the origin, since V is to vary as Ze/r, β must approach a constant value

$$\alpha = \frac{Ze^2}{kTc} = 0.0899\ Z/T_{kv}^{3/4} \tag{19}$$

Because of the singular behavior of $I_{1/2}(\beta/s)$ as $s \to 0$ (it varies as $s^{-3/2}$) numerical integration from the origin is laborious. To avoid this difficulty, another procedure was used. Setting $s = w^2/2$, Eq. (17) becomes,

$$\frac{d}{dw}\ \frac{1}{w}\ \frac{d\beta}{dw} = 2w^3\ I_{1/2}(2\beta/w^2) \tag{20}$$

The equation was integrated from the outside ($w^2 = 2a/c$) inwards (to $w = 0$) and no difficulties arise as the origin is approached. The limiting value of β as $w \to 0$, i.e., α is easily determined. The solution is started by choosing, arbitrarily, a value of b, and of β at $s = b$ and using Eq. (18) or its equivalent $\frac{d\beta}{dw} = 2\beta/w$ to get the initial value of the derivative of β. It is only after the solution is complete and the value of α is determined that the temperature (from Eq. (19)) and the density (from $a = bc$ where c is given by Eq. (16)) can be evaluated. That these turn out to be in an interesting region requires judicious choice of the initial values of b and β, but this is not a real difficulty.