TABLE IV

p-level ($N = 2,\ l = 1$)		
E ɔmic units	r_0 atomic units	from section
−0.1250	∞	3a
−0.1193	10.235	3b
−0.1097	8.540	3b
−0.0895	7.089	3b
−0.0800	6.701	3b
−0.0740	6.497	3b
−0.0566	6.000	3a
−0.0408	5.696	3b
−0.0312	5.528	3a
−0.0200	5.355	3a
0	5.086	3c
0.0312	4.770	3d
0.0556	4.554	3d
0.1250	4.110	3d
0.5000	2.698	3d
0.8261	2.528	3d
2.524	1.68	3f
3.116	1.55	3f
3.943	1.41	3f
∞	0	3e

the points $r = 0$ and $r = \infty$. For several
ɔd 1 zero points have been calculated and
lication § 3a) and represented in the fi-
splitting up of the second level into 2s
It is obvious that by using only integer
n the curves is left between $n = l + 1$
en $r_0 = \infty$ and a comparatively small
arge radii r_0 this gap could be filled by the
ves only approximative values.
gap in the curve it is necessary to find
ıent hypergeometric function with real
interpolated from tables [6]) [7]) with the
ɔolation procedures (v. tables II–IV and

; case of $n \to \infty$ has been studied by
e l k e r [2]), especially for the 1s level. The
function (6) for $n \to \infty$ is proportional

$$,\rho) \sim J_{2l+1}(2\sqrt{\rho n}) = J_{2l+1}(2\sqrt{2r}). \tag{24}$$

The first and second node of J_1 give the values for the 1s and 2s level. The first zero point of J_3 gives the intersection of the 2p level with the r_0-axis. (v. tables II–IV and figures).

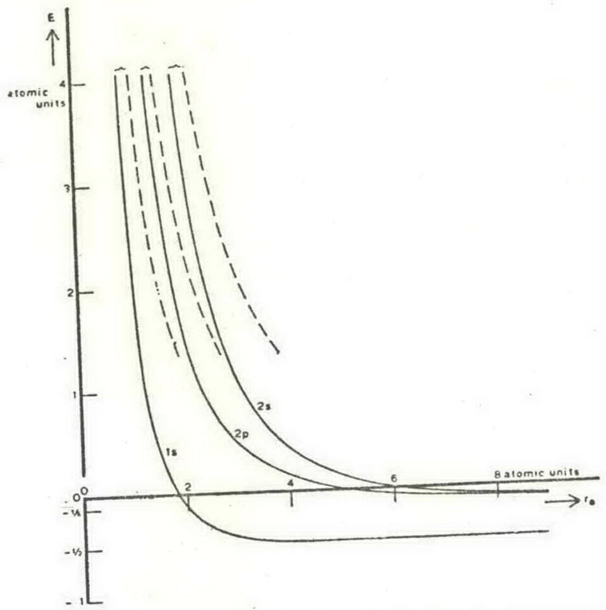

Fig. 3. The (E, r_0)-curves for the 1s, 2s and 2p-levels. Asymptotes are the dotted lines and $r_0 = 0$, $E = -0.5$ (for the 1s surve) and $E = -0.125$ (for the 2s and 2p curves).

S o m m e r f e l d and W e l k e r stressed the importance of a more general investigation of the behaviour of confluent hypergeometric functions F in the neighbourhood of $n = \infty$ or $E = 0$. For that purpose function F of equation (6) must be expanded as a power-series in n^{-1}. By the definition of F (7) and with (6) and (2) the wave function can be written:

$$F(l+1-n,\ 2l+2,\ 2rn^{-1}) = \sum_{k=0}^{\infty} \frac{(-1)^k\,(2r)^k\,(2l+1)!}{k!\,(2l+k+1)!} \prod_{\nu=1}^{k} \{1-(l+\nu)n^{-1}\}. \tag{25}$$

The product can be written as the sum $\sum_{\nu=0}^{k} (-1)^{\nu}\, a_{\nu}^{k,l}\, n^{-\nu}$ where $a_{\nu}^{k,l}$ is the sum of the $\binom{k}{\nu}$ products of ν different numbers of the series $l+1,\ l+2,\ \ldots,\ l+k$ (without repetitions). The first three *) are

$$a_0^{k,l} = 1, \tag{26}$$

$$a_1^{k,l} = \tfrac{1}{2}k(k + 2l + 1), \tag{27}$$

$$a_2^{k,l} = k(k-1)\,\{\tfrac{1}{2}l^2 + \tfrac{1}{2}(k+1)\,l + \tfrac{1}{24}(k+1)(3k+2)\}. \tag{28}$$

*) The N e w t o n relations [2]) that can eventually be used to calculate these coefficients are of course also valid here.