

Energy levels and notation

Principal quantum no. $n = 1, 2, 3, \dots$

Angular momentum quantum no. $\vec{L} = \sum \vec{l}_i$

$l: 0 \quad 1 \quad 2 \quad 3 \quad \dots$

notation: $s \quad p \quad d \quad f \quad \dots$

$L: 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad \dots$

notation: $S \quad P \quad D \quad F \quad G \quad \dots$

Spin quantum no. $\vec{S} = \sum \vec{s}_i, \quad s_i = \pm 1/2$

Total angular momentum quantum no. $\vec{J} = \vec{L} + \vec{S}$

Notation $n^{2S+1}L_J$

H: ground state $1^2S_{1/2}$ doublet (1s)

excited state $2^2S_{1/2}$ (2s)

$2^2P_{1/2}$ or $2^2P_{3/2}$ (2p)

He: 2 electrons

opposite spin $2S+1=1$ singlet "para"

parallel spin $2S+1=3$ triplet "ortho"

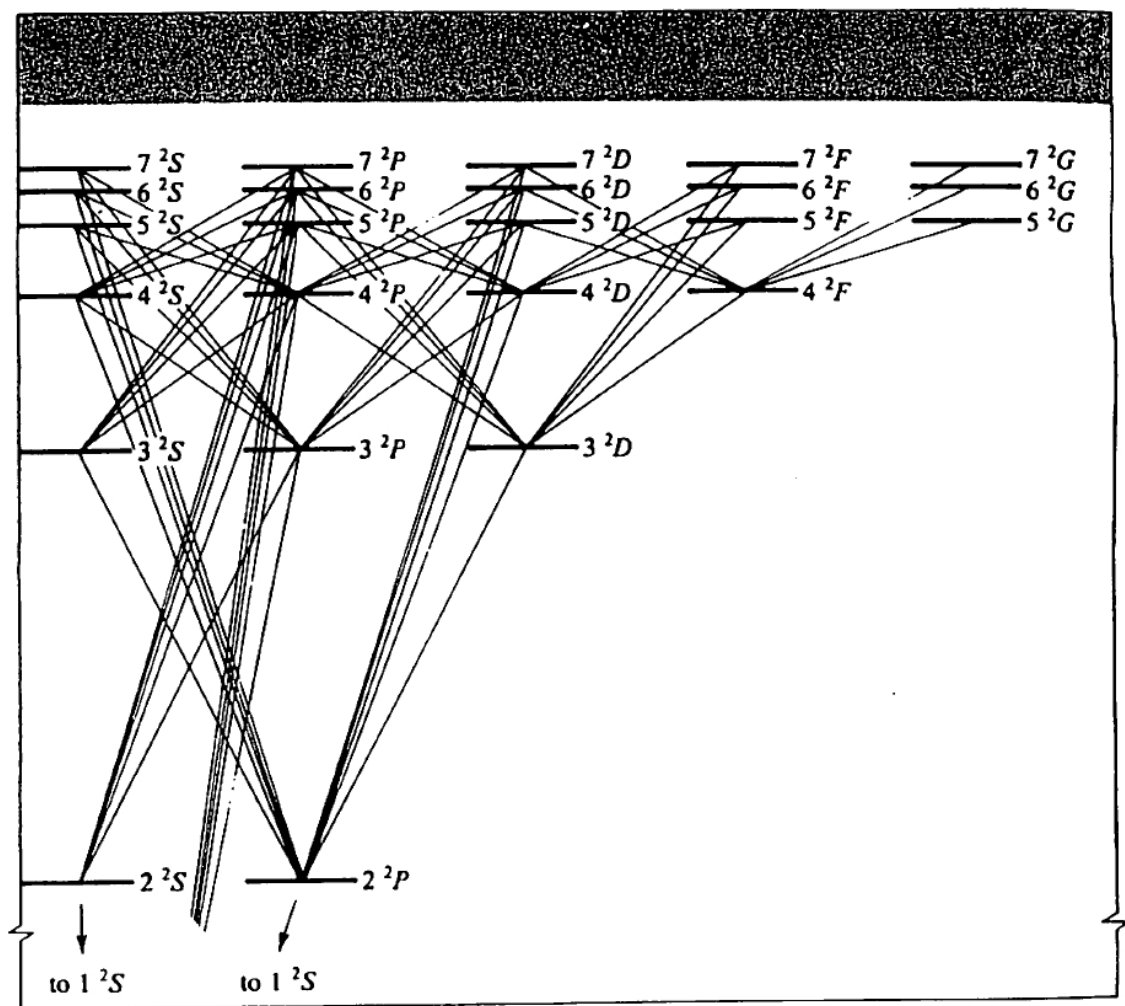
Singlet: ground state 1^1S_0

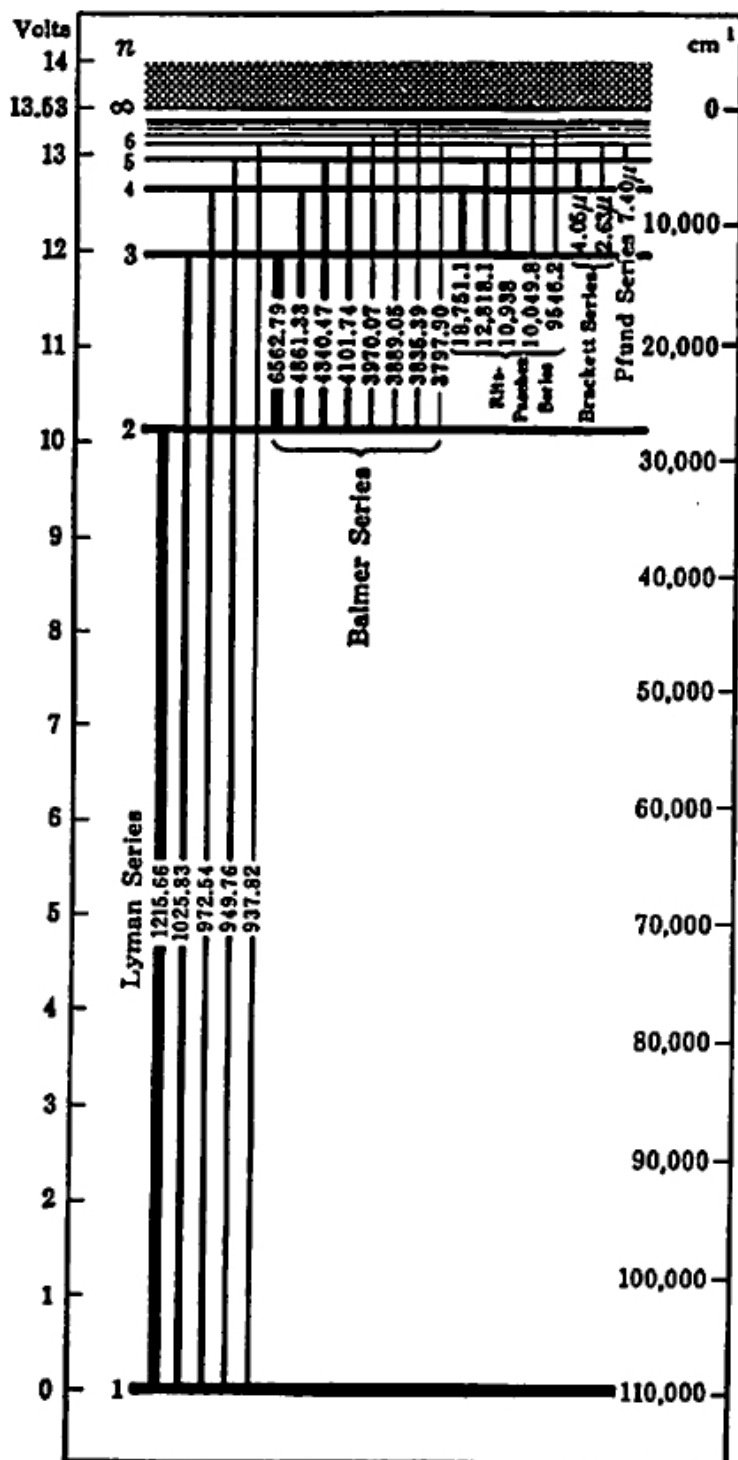
excited state $2^1S_0, 2^1P_1$

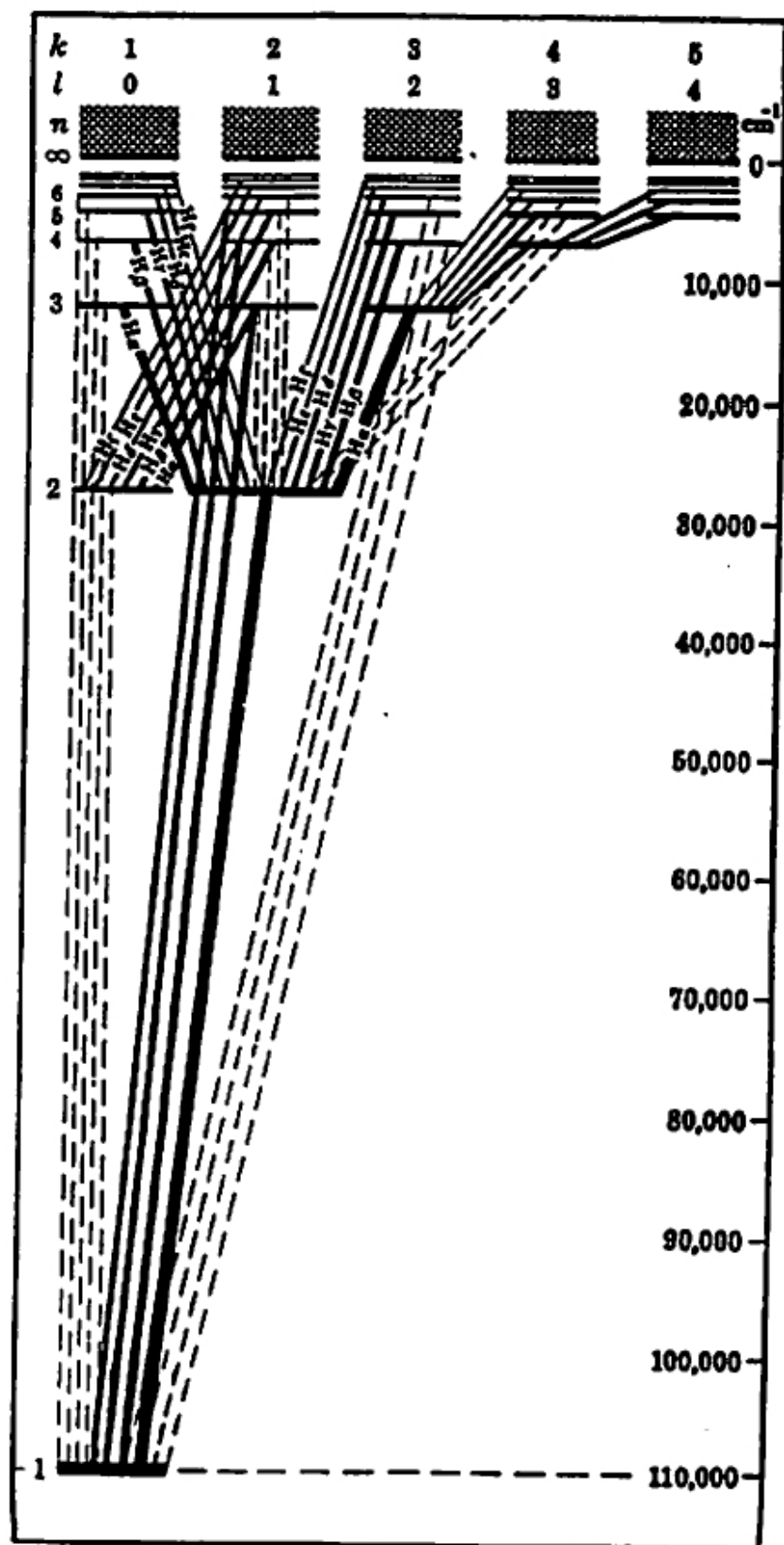
Triplet: ground state 2^3S_1

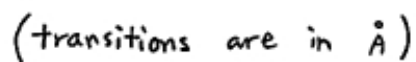
excited state $2^3P_0, 2^3P_1, 2^3P_2$

Permitted: $\Delta S = 0, \Delta L = \pm 1$









Energy Level Diagram of Helium.