

The total angular momentum & magnetic moment

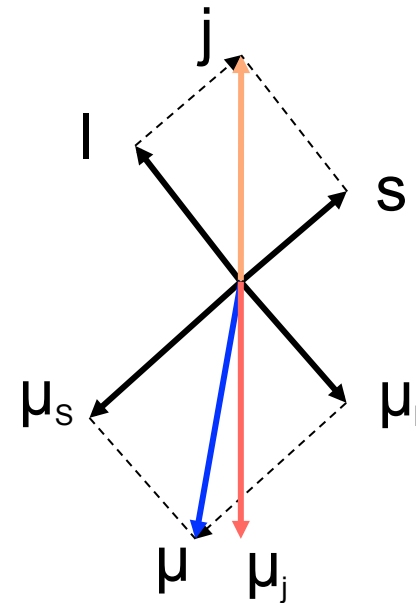
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$$\vec{j} = \vec{l} + \vec{s}, \quad \mu = \mu_l + \mu_s$$

$$\mu_j = \mu_l \cos(j, l) + \mu_s \cos(j, s)$$

$$= -g_j J \mu_B$$

$$g_j = \frac{3}{2} + \frac{1}{2} \left(\frac{\hat{s}^2 - \hat{l}^2}{\hat{j}^2} \right)$$

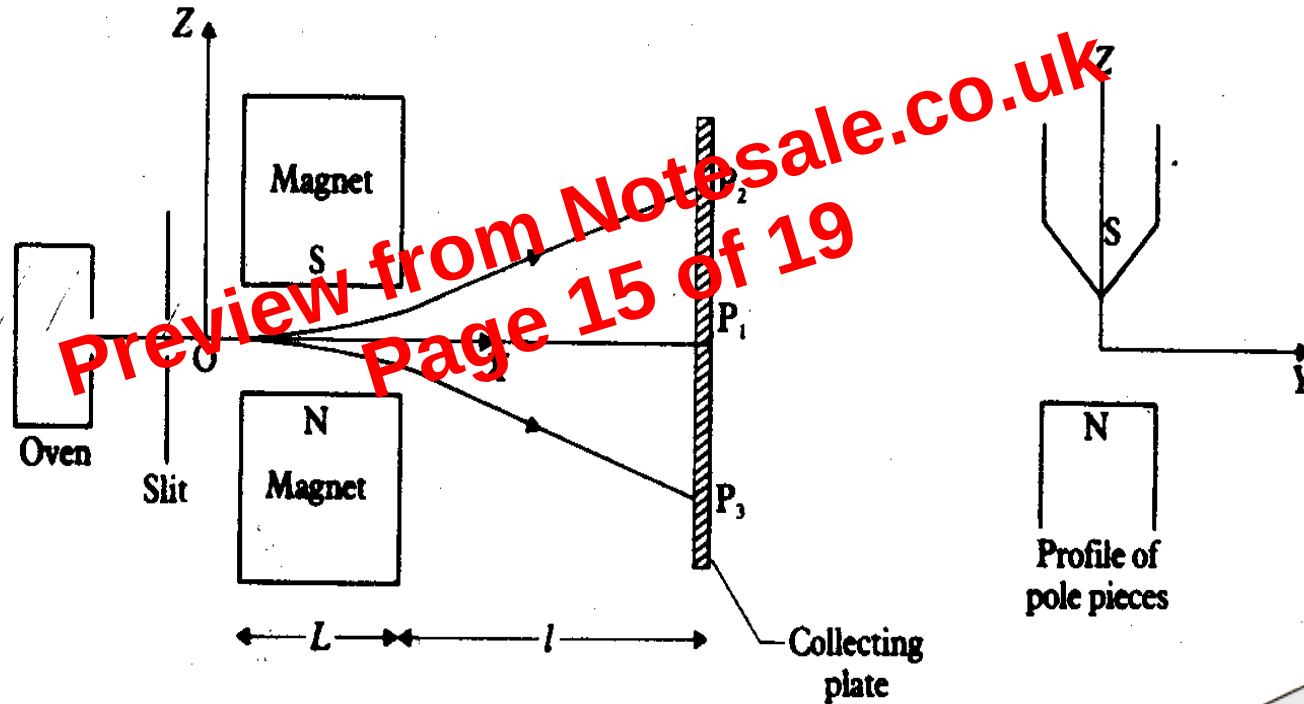


Alkali metals

- Selection rules:
- The **first primary** series: $nP \rightarrow 2S$, P: double substates, doublet, two lines are getting closer with n increased.
- The **sharp secondary** series: $nS \rightarrow 2P$, doublet, two lines are separated uniformly with n increased.
 $\Delta l = \pm 1,$
 $\Delta j = \pm 1, 0$
- The **diffuse secondary** series $nD \rightarrow 2P$, are triplet, D & P are both split into substates.
 ${}^2D_{5/2} \rightarrow {}^2P_{3/2}, {}^2D_{3/2} \rightarrow {}^2P_{3/2}, {}^2D_{3/2} \rightarrow {}^2P_{1/2};$
 ${}^2D_{5/2} \rightarrow {}^2P_{1/2}(?)$

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Stern-Gerlach apparatus



1.22 The Stern-Gerlach apparatus.

