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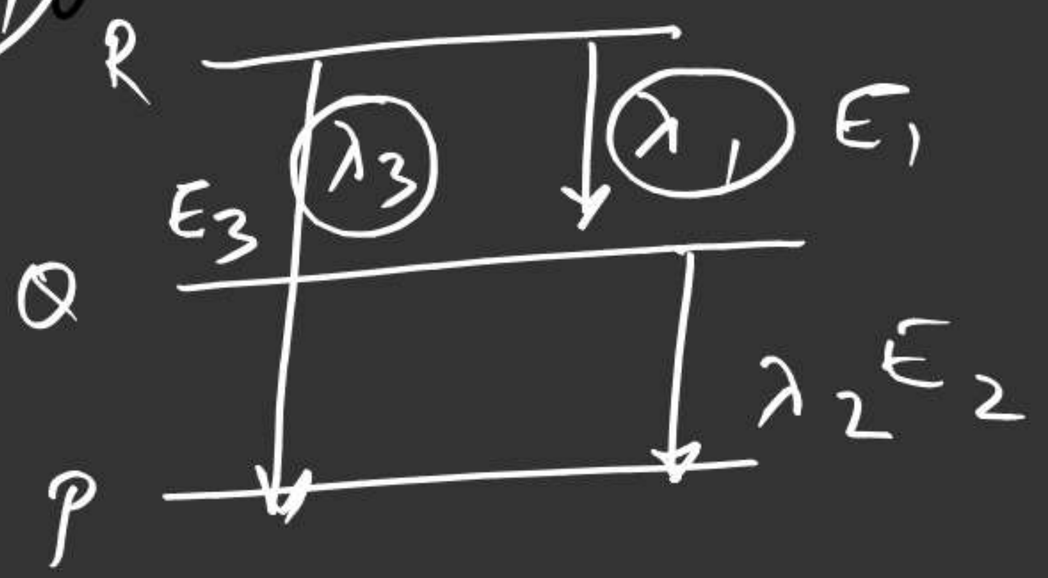

$$E_3 = E_1 + E_2$$

$$\frac{hc}{\lambda_3} = \frac{hc}{\lambda_1} + \frac{hc}{\lambda_2}$$

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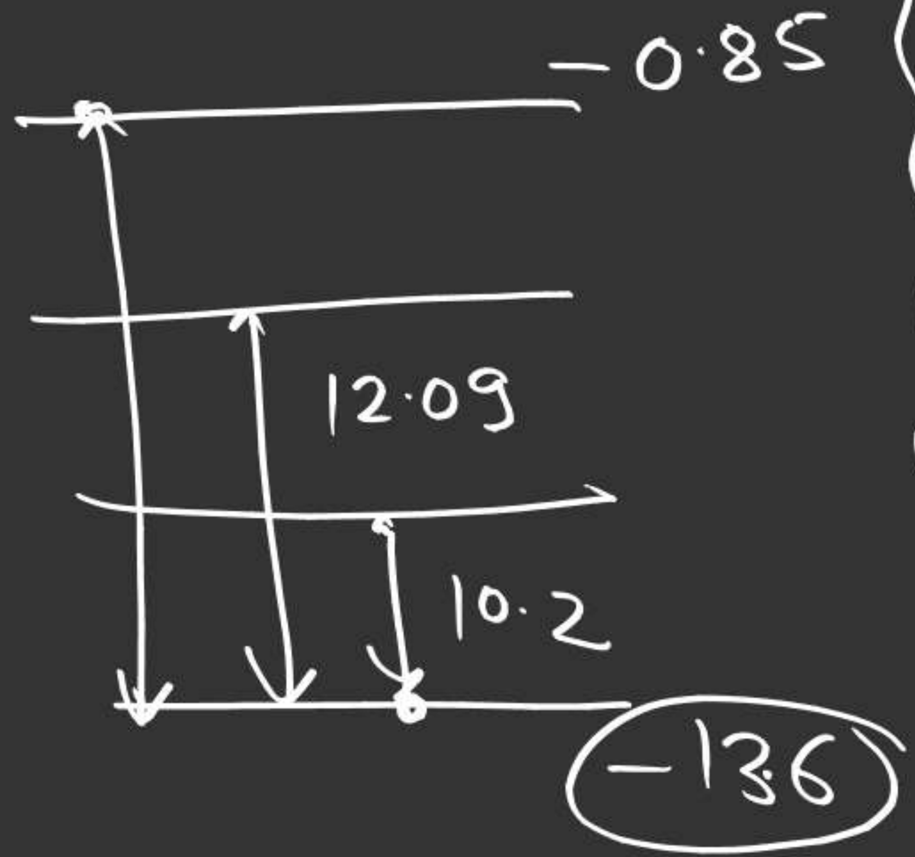
12.75

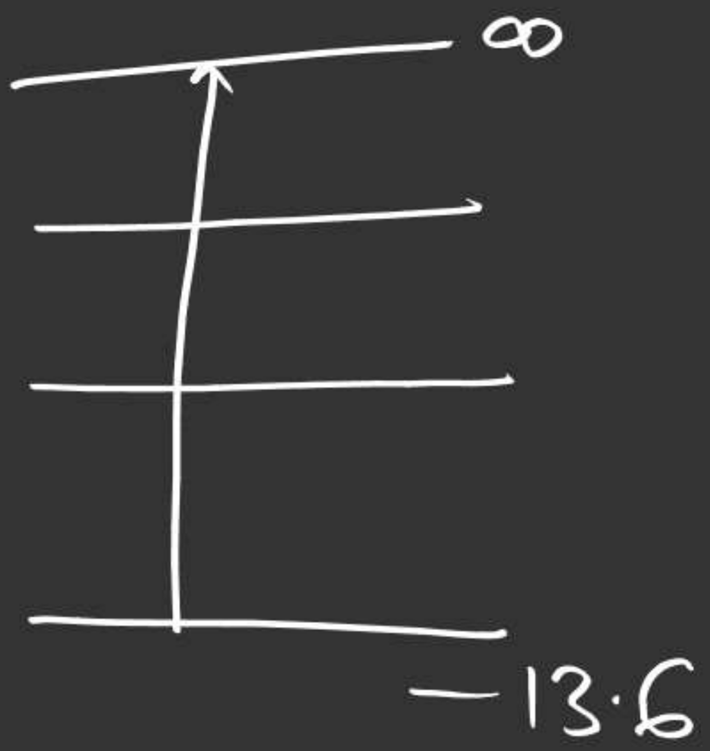


$$12.75 = 13.6\left[\frac{1}{1} - \frac{1}{n_2^2}\right]$$

$mvr = J$

$KE = \frac{1}{2}\frac{mv^2 \times mr^2}{mr^2}$

$= \frac{1}{2}\frac{J^2}{mr^2}$



$TE = -13.6\frac{Z^2}{n^2}$

13.6

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$Li \longrightarrow Li^{3+} + 3e^-$

$IE_1 + IE_2 + IE_3 = 19800$

$520 + IE_2 + IE_3 = 19800$

$T.E = -13.6 \times \frac{9}{1}$

$= -13.6 \times 9 \times 1.6 \times 10^{-19} \times N_A$

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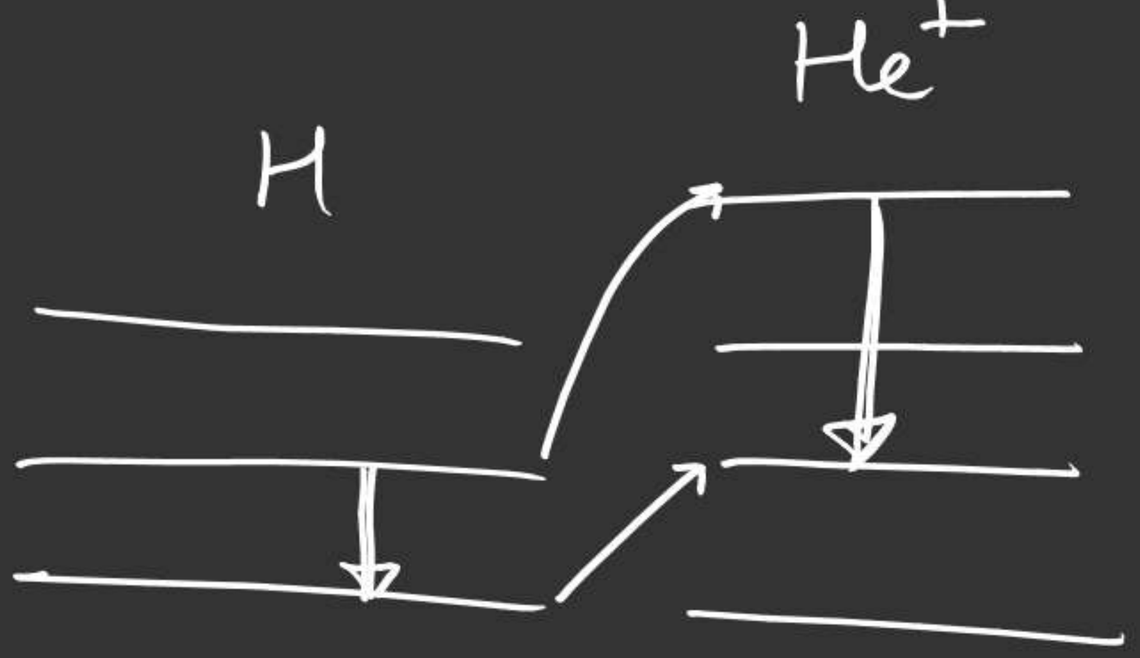

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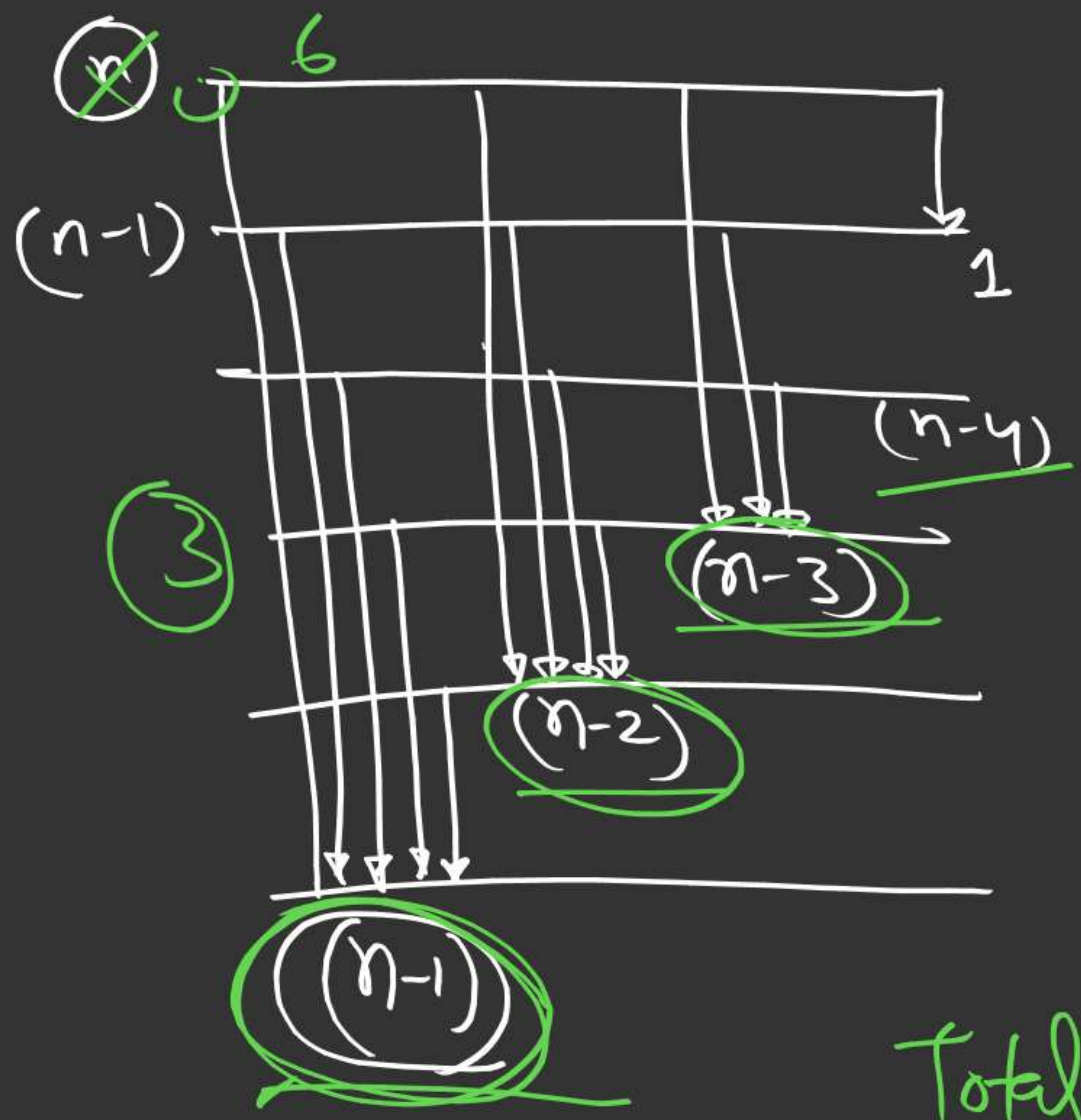
$n_1 + n_2 = 4$

$n_2^2 - n_1^2 = 8$

$n_2 - n_1 = 2$

$$\boxed{\begin{aligned} n_2 &= 3 \\ n_1 &= 1 \end{aligned}}$$

no. of spectral lines



Total no spectral line

$= 1 + 2 + \dots\dots n-1$

$= \left(\frac{(n-1)n}{2}\right) = {}^{n}C_2$

n = no. of energy levels involved

if e^-s jumps $n \to 1$

no. of spectral lin

	$3 \to 1$	$4 \to 1$	$5 \to 1$	$6 - 1$
Total	$\to 3$	6	10	15

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e^-s in 'H' atoms sample jump from 6^{th} level to ground level. find

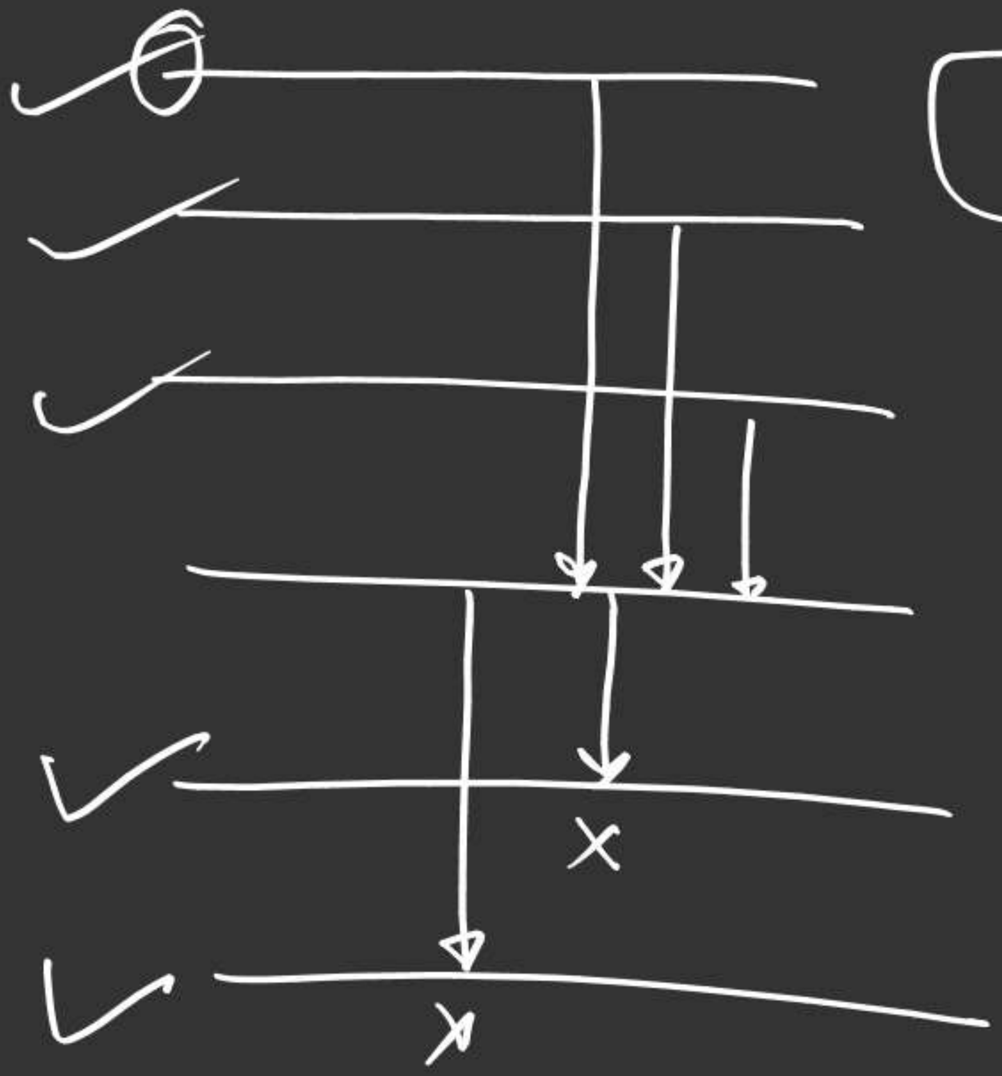
① Total no. of spectral line $= \frac{n(n-1)}{2} = 15$

② no. of Lyman series radiation $= 6-1 = 5$

③ no. of Paschen series radiations $= 6-3 = 3$

Q. e^- in 'H' atoms sample jumps from 6^{th} level to ground level without emitted any paschen series lines find total no. of spectral lines.

Ans 10



$$\boxed{15-5=10}$$

$$\frac{(5-1)(5)}{2} = 10$$

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Ionisation energy: Amt of energy required to remove an e^- from an atom

$$\underline{\underline{E_\infty}} = -13.6\frac{Z^2}{\infty} = 0$$

$$\text{Ionisation Energy} = E_\infty - E_n = 0 + 13.6\frac{Z^2}{n^2}$$

$$I.E = 13.6\frac{Z^2}{n^2} = -TE$$

IE of H = 13.6 eV

" $He^+ = 54.4$

Binding energy = IE

extra energy above IE will be converted into KE of released e^-

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Q. Assuming Bohr quantization of angular momentum is applicable on our solar system. Considering only one planet in solar system i.e. earth and using gravitational force find expression for r, v & TE of earth.

$$\text{Force} = \frac{GMm}{r^2}$$

$$\text{Potential Energy} = -\frac{GMm}{r}$$

$$F = -\frac{dU}{dr}$$

$$= +\frac{d}{dr}\left(+\frac{GMm}{r}\right)$$

$$= -\frac{GMm}{r^2}$$

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$$\frac{mv^2}{\cancel{r}} = \frac{GMm}{r^2} \quad \text{--- } 1$$

$$mvr = \frac{nh}{2\pi} \quad \text{--- } 2$$

$$\frac{\cancel{m}}{r} \cdot \frac{n^2h^2}{4\pi^2 m^2 \cancel{r^2}} = \frac{GM\cancel{m}}{\cancel{r^2}}$$

$$r = \frac{n^2h^2}{4\pi^2 GMm^2}$$

$$mv\,\frac{n^2h^2}{4\pi^2 GMm^2} = \frac{nh}{2\pi}$$

$$v = \frac{2\pi GMm}{nh}$$

$$T.E = \frac{1}{2}mv^2 - \frac{GMm}{r}$$

$$= -\frac{GMm}{2r}$$

$$T.E = -\frac{2\pi^2 G^2M^2m^3}{n^2h^2}$$

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Q. Using Bohr quantization of angular momentum find expression of r, v & T.E for a single e^- hypothetical system for which $PE = k \ln r$

$$F = -\frac{dU}{dr} = -\frac{k}{r}$$

$$\frac{mv^2}{r} = \frac{k}{r} \quad \text{— (1)} \Rightarrow v = \sqrt{\frac{k}{m}}$$

$$mvr = \frac{nh}{2\pi} \quad \text{— (2)}$$

$$\sqrt{m}\, m r \sqrt{\frac{k}{\cancel{\sqrt{m}}}} = \frac{nh}{2\pi}$$

$$r = \frac{nh}{2\pi\sqrt{km}}$$

$$T.E = \frac{1}{2}mv^2 + k\ln r$$

$$= \frac{1}{2}\cancel{m}\frac{k}{\cancel{m}} + k\ln r$$

$$= k\left(\frac{1}{2} + \ln r\right)$$

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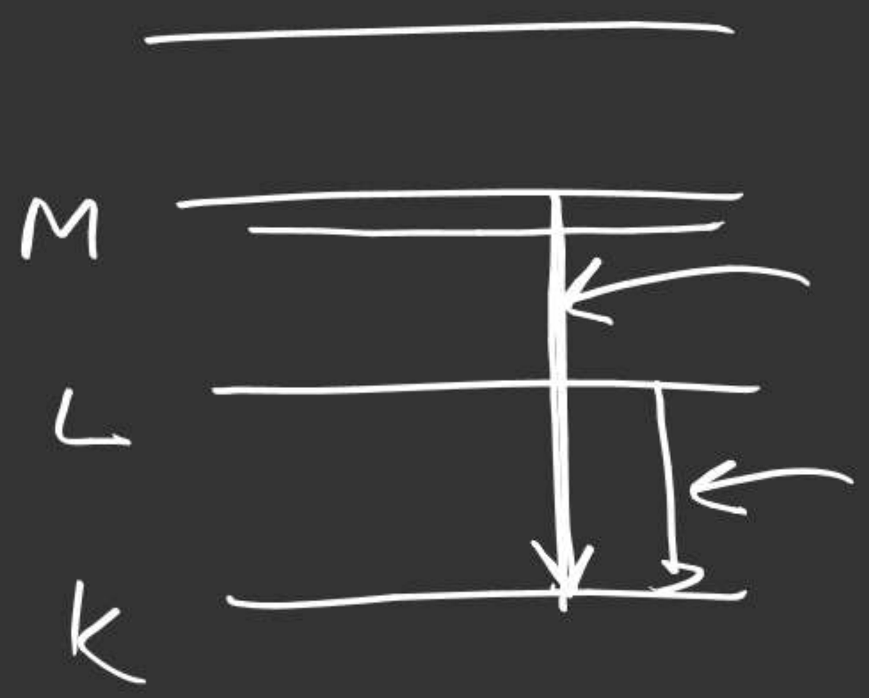
Drawbacks

1) Bohr Model failed to explain the fine spectrum of hydrogen atom.

2) Bohr model failed to explain the splitting of spectral lines in the presence of external electric field called (Stark effect) and magnetic field call Zeeman effect



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