Модель Бора

$\hbar = \dfrac{h}{2\pi}$

3 постулата Бора

1) ∃ орбитали

2) $L = n\hbar$, $n = 1, 2, \ldots$

3) изл/погл.

$\hbar \omega_{mn} = E_m - E_n$

$$\begin{cases} m\dfrac{v^2}{r} = \dfrac{1}{4\pi\varepsilon_0}\dfrac{Ze^2}{r^2} \\ L = n\hbar = mvr \end{cases} \Rightarrow r_n = \frac{\hbar^2}{me^2} \cdot \frac{n^2}{Z} = a_0 \cdot n^2, \quad Z = 1\ (H)$$

$a_0 = 0.5\ Å$

$$v_n = \frac{n\hbar}{mr_n} = \frac{Ze^2}{n\hbar}$$

$\hbar\omega_{mn} = E_m - E_n$

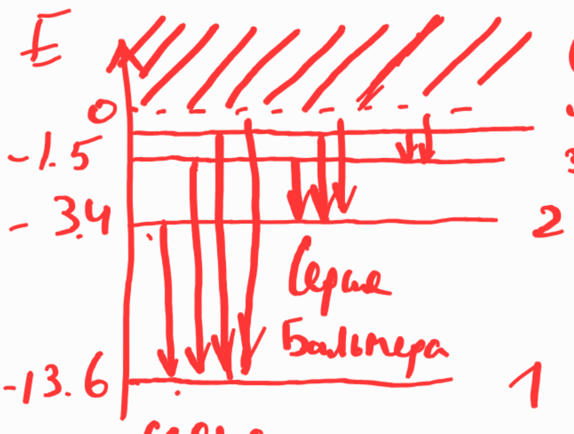
$\lambda\nu = c$

$$\boxed{\omega_{mn} = 2\pi\nu = \frac{2\pi c}{\lambda}}$$

$$E_n = K_n + U_n = \frac{mv_n^2}{2} - \frac{1}{4\pi\varepsilon_0} \cdot \frac{Ze^2}{r_n} = -\frac{me^4}{2\hbar^2} \cdot \frac{Z^2}{n^2} = -\frac{13.6\ эВ}{n^2}$$

$Z \to 1$

$$\frac{h}{\cancel{2\pi}} \cdot \frac{\cancel{2\pi} c}{\lambda} = \frac{hc}{\lambda_{mn}} = E_m - E_n = -13.6\ эВ\left(\frac{1}{m^2} - \frac{1}{n^2}\right)$$



Ly_α : $\boxed{\lambda_{mn} = \dfrac{hc}{13.6} \cdot \dfrac{1}{1/n^2 - 1/m^2}}$

$$\frac{1}{\lambda_{mn}} = R\left(\frac{1}{n^2} - \frac{1}{m^2}\right)$$

$$\lambda_{H\alpha} = \frac{1}{R} \cdot \frac{1}{\frac{1}{4} - \frac{1}{9}} \simeq 6563\ Å$$

$$\lambda_L = \frac{1}{R} \cdot \frac{4}{3} = 1215\ Å$$

Серия Лаймана

$\lambda_{H_\beta} = \dots = 4861\,Å$

$\lambda_{H_{\infty\to2}} = 3645\,Å$

$\lambda_{Ly\beta} = \frac{1}{R}\cdot\frac{9}{8} \simeq 1025\,Å$

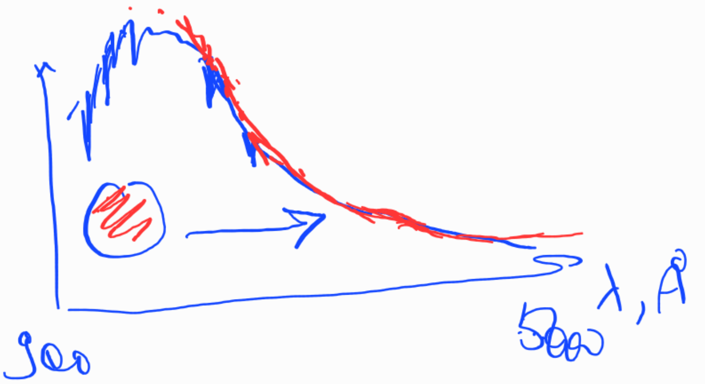
$912\cdot10^{-10}$

$\lambda_{Ly\infty} = \frac{1}{R} = 912\,Å$

$R = \frac{1}{912\cdot10^{-10}}$

$\lambda_{11\to10} = ?$

$\lambda = \frac{1}{R}\,\frac{1}{1/100 - 1/121} \sim 0.05$ мм



$h\nu = \chi_n + K$

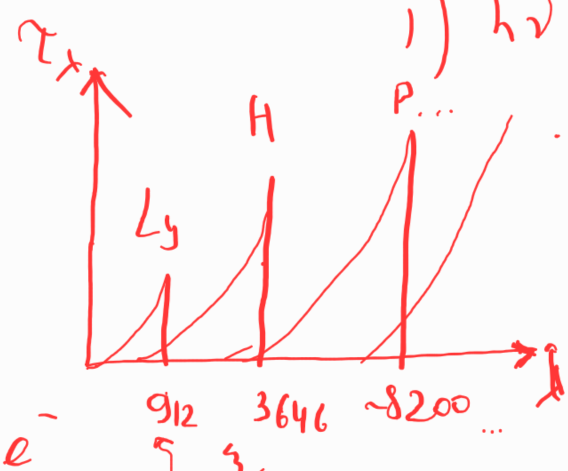
τ_λ

$dI_\lambda = \tau_\lambda I_\lambda\, dx$

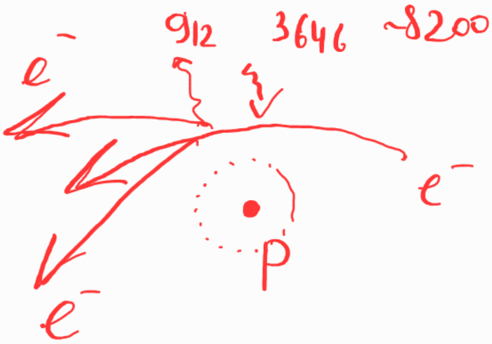
1) b-f

2) f-f

1) $h\nu \geq \chi_n + K$

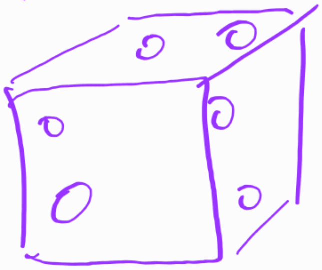


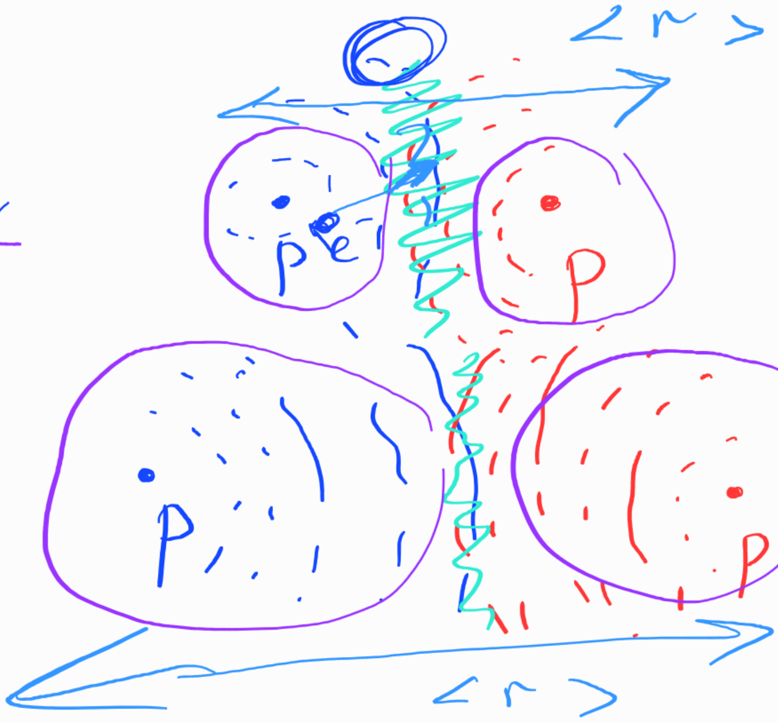
2) f-f



$r_n \simeq a_0 n^2$

n больше $\Rightarrow \langle r \rangle \downarrow$





$$\Delta E_{n,n+1} = \ldots$$

$$\Delta E_{зам} \simeq \varepsilon \cdot e \cdot r_n^{\ d}$$

$$\varepsilon \sim \frac{e}{r_0^2} \sim e N^{2/3}$$

$$N \cdot V = 1 = N \cdot \frac{4}{3}\pi r_0^3$$

$$r_0 = \sqrt[3]{\frac{3}{4\pi N}} \sim N^{-1/3}$$

$$E_n \sim \frac{1}{n^2}, \quad r_n \sim n^2$$

$$r_n = a_0 n^2 \qquad a_0 \leftarrow 0.5\ \text{Å}$$

$$E_n = -\frac{13.6\ эВ}{n^2} = \frac{e^2}{2a_0} \cdot \frac{1}{n^2}$$

$$\Delta E_{возм} = r_n e \varepsilon \sim n^2 a_0 e^2 N^{2/3}$$

$$\Delta E_{возм} = \Delta E_{n+1,n} = 13.6\left(\frac{1}{n^2} - \frac{1}{(n+1)^2}\right) \underset{n \gg 1}{=} \frac{e^2}{2a_0 n^2}\left(1 - \underbrace{\left(\frac{n}{n+1}\right)^2}_{1-2/n}\right) \approx \boxed{\frac{e^2}{a_0 n^3}}$$

$$n^2 a_0 \cancel{e^2} N^{-2/3} \simeq \frac{\cancel{e^2}}{a_0 n^3} \Rightarrow N^{-2/3} = \frac{1}{a_0^2 \cdot n^5} \Rightarrow N \sim n^{-7.5}$$

$$\boxed{\log N = -7.5 \lg n_{max} + 23.5}$$

$T_\odot \simeq 5800\ K$

$t_{вр} \simeq 25^d$

$$\frac{\Delta\lambda}{\lambda} = \frac{V}{c}$$

$$V \simeq \sqrt{\frac{3kT}{m}} \sim 12\ \frac{км}{с}$$

W_{nununu} ?

$$\Delta\lambda = \frac{v}{c}\lambda \simeq 0.2\ \mathring{A}$$

$$W = 2\Delta\lambda \simeq 0.4\ \mathring{A}$$

$$J_x(\lambda) = C\, J_1(\lambda) \cdot 10^{-E(\lambda)/2.5}, \quad E(\lambda) = 0.002\,d\left(\frac{\lambda}{5..}\right)^{-1.3}$$

$$2.5 \lg\left(\frac{J_x}{J_1}\right) = \tilde{C}' + 0.002\left(\frac{\lambda}{5500}\right)^{-1.3} \cdot d = a + bx$$