1. $\underline{L_0 = n\hbar}$:

$$L_0 = r \cdot p_0 = r(vm) \overset{!}{=} n\hbar$$

$$v = \frac{n\hbar}{mr}$$

2. $\underline{F_e = F_Z}$:

$$\frac{1}{4\pi\varepsilon_0}\frac{e^2}{r^2} = m\frac{v^2}{r} \Rightarrow v^2 = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{rm}$$

1. $\wedge$ 2.

$$\left(\frac{n\hbar}{mr}\right)^2 = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{rm} \qquad \alpha = \frac{e^2}{4\pi\varepsilon_0\hbar c}$$

$$r = 4\pi\varepsilon_0 \frac{n^2\hbar^2}{m} \cdot \frac{1}{e^2} \cdot \frac{c}{c}$$

$$= \frac{n^2\hbar}{cm\alpha}$$

$$E_p = \frac{1}{4\pi\varepsilon_0}\frac{e^2}{r}$$

$\vdots$

$$= -\frac{2R}{n^2}$$

$$v = \frac{n\hbar}{mr} = \frac{n\hbar}{m} \cdot \frac{cm\alpha}{n^2\hbar} = \frac{c\alpha}{n}$$

$$E_k = \frac{1}{2}m\frac{c^2\alpha^2}{n^2} = \frac{\frac{1}{2}mc^2\alpha^2}{n^2} =: \frac{R}{n^2}$$

5

Bohrův model

$$E_{k,n} = \frac{R}{n^2} \quad n \in \mathbb{N}$$

→ z viriálového teorému $\left(U \propto r^{k} \Rightarrow 2\langle E_k \rangle = k \langle E_p \rangle \right)$ potenciál

$$U = -\frac{1}{4\pi\varepsilon} \frac{e}{r} \Rightarrow 2E_k = -E_p \Rightarrow E_p = -\frac{2R}{n^2}$$

$$E = E_k + E_p = -\frac{R}{n^2}$$

$$E_{k,n} = \frac{1}{2} m v_e^2$$

$$\Rightarrow v_e = \sqrt{\frac{2R}{m_e}} \frac{1}{n} \approx \frac{0{,}00730}{n} c$$

$$\Delta E_{2,3} = E_3 - E_2 = -\frac{R}{3^2} + \frac{R}{2^2} = R\left(\frac{1}{4} - \frac{1}{9}\right) =$$

$$\overset{!}{=} \frac{hc}{\lambda} \Rightarrow \lambda = \frac{hc}{R\left(\frac{1}{4} - \frac{1}{9}\right)} \approx 655{,}5 \text{ nm}$$