hydrogen atom : orbits and orbitals

$$\psi_{100} = \frac{1}{\sqrt{\pi a^3}} e^{-r/a} : \psi_{1s}$$

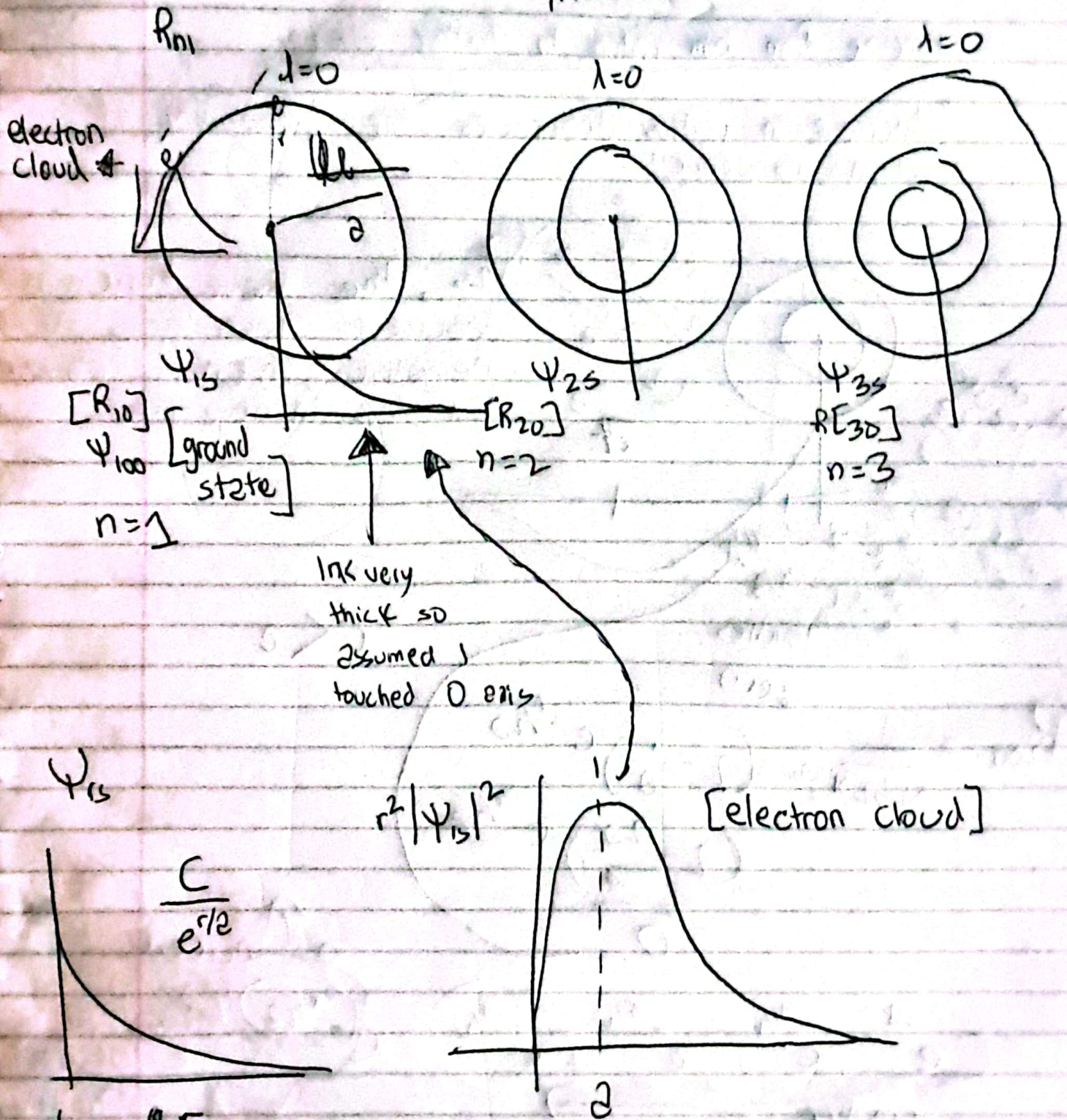
$$\psi_{200} = \frac{1}{\sqrt{32\pi a^3}} \left(2 - \frac{r}{a}\right) e^{-\frac{r}{2a}} : \psi_{2s}$$

$$\psi_{300} = \frac{1}{\sqrt{162\pi a^3}} \left\{6 - 6\left(\frac{2}{3}\frac{r}{a}\right) + \left(\frac{2}{3}\frac{r}{a}\right)^2\right\} e^{-r/3a} \psi_{3s}$$

⇒ $l = 0$: θ and ϕ

R

S orbitals :- spherically symmetric

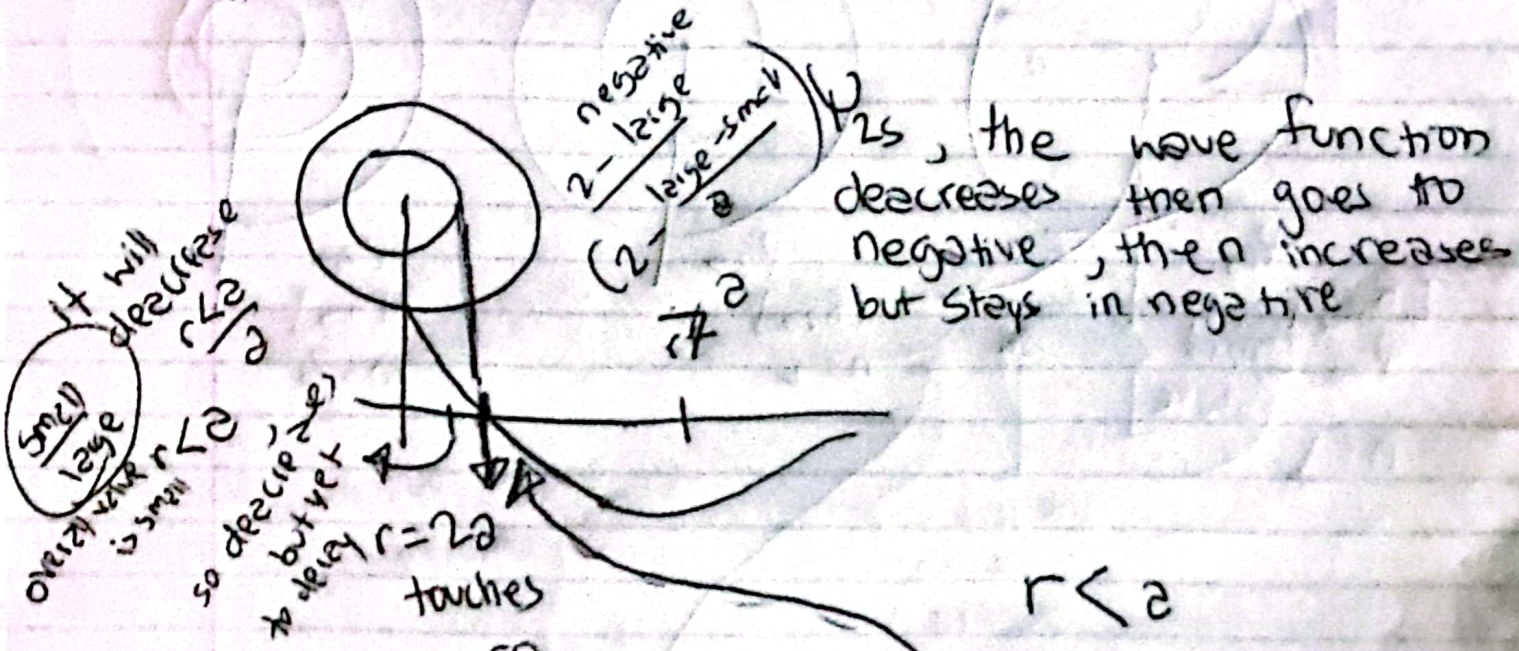


timeline: From nucleus to bohr radius

"Increase in radius increases the probability of electrons existance until it reaches the bohr radius" [greatest peek]

timeline from bohr radius to further away

"Increase in radius decreases the probability of electron's existance"



ψ_{2s}, the wave function decreases then goes to negative, then increases but stays in negative

$$\psi_{200} = \frac{1}{\sqrt{32\pi a^3}} \left(2 - \frac{r}{a}\right) e^{-r/2a}$$

$$\left(2 - \frac{2a}{a}\right) e^{-r/2a}$$

$$0$$

e^{-1}, $e^{-3/2}$, $e^{-5/2}$, $e^{-7/2}$

smaller

$e^{-r/2a}$ increase

value become smaller

(smaller)(negative)

Close to 0 small $e^{-5/2}$ smallest

small $e^{-3/2}$ smallerest

smaller e^{-1} smaller

smallest small

(smallest value)(negative)

small