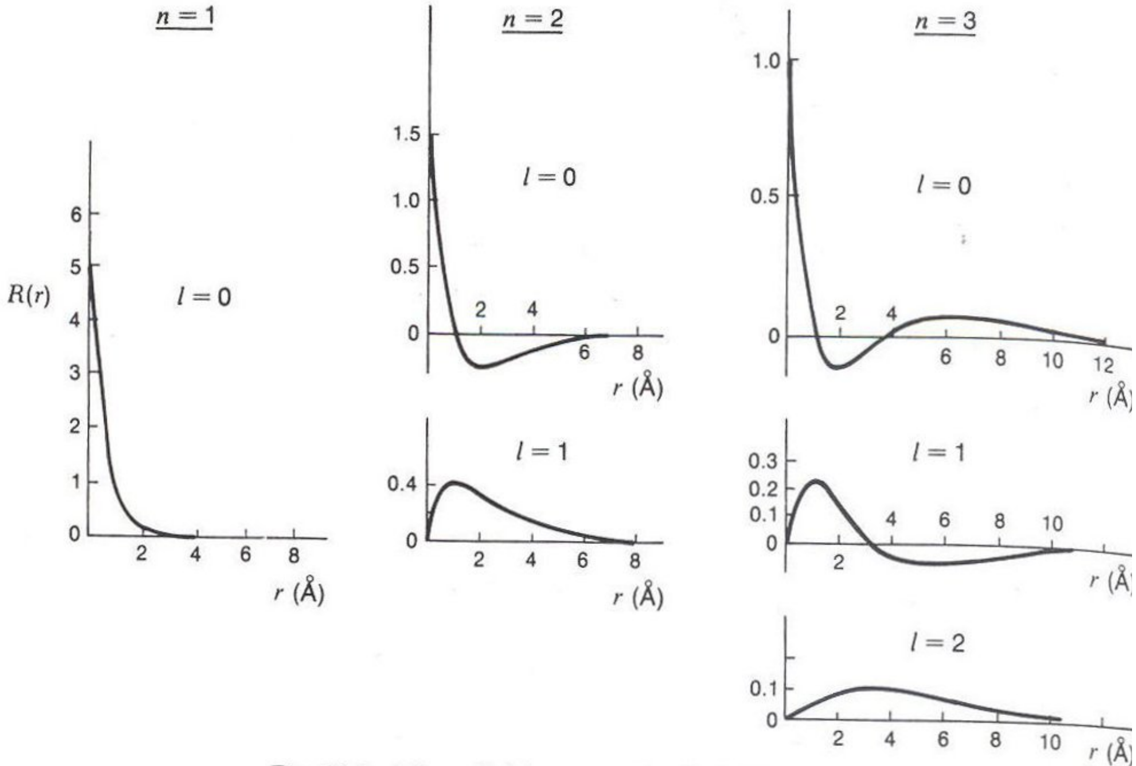


Fig. 12-3 The radial functions R(r) for hydrogen. [Note: *The radius is measured here in angstroms rather than in Bohr radii.*] *The units of R are* 10^{12} *cm.*$^{-3/2}$

ΠΙΝΑΚΑΣ 9.3. *Οι ακτινικές συναρτήσεις* $R_{n\ell}$ *μέχρι* $n = 3$

	$\ell = 0$	$\ell = 1$	$\ell = 2$
$n = 1$	$R_{10} = 2e^{-r}$		
$n = 2$	$R_{20} = \frac{1}{\sqrt{2}}\left(1 - \frac{r}{2}\right)e^{-r/2}$	$R_{21} = \frac{r}{2\sqrt{6}}e^{-r/2}$	
$n = 3$	$R_{30} = \frac{2}{3\sqrt{3}}\left(1 - \frac{2r}{3} + \frac{2r^2}{27}\right)e^{-r/3}$	$R_{31} = \frac{8r}{27\sqrt{6}}\left(1 - \frac{r}{6}\right)e^{-r/3}$	$R_{32} = \frac{4r^2}{81\sqrt{30}}e^{-r/3}$

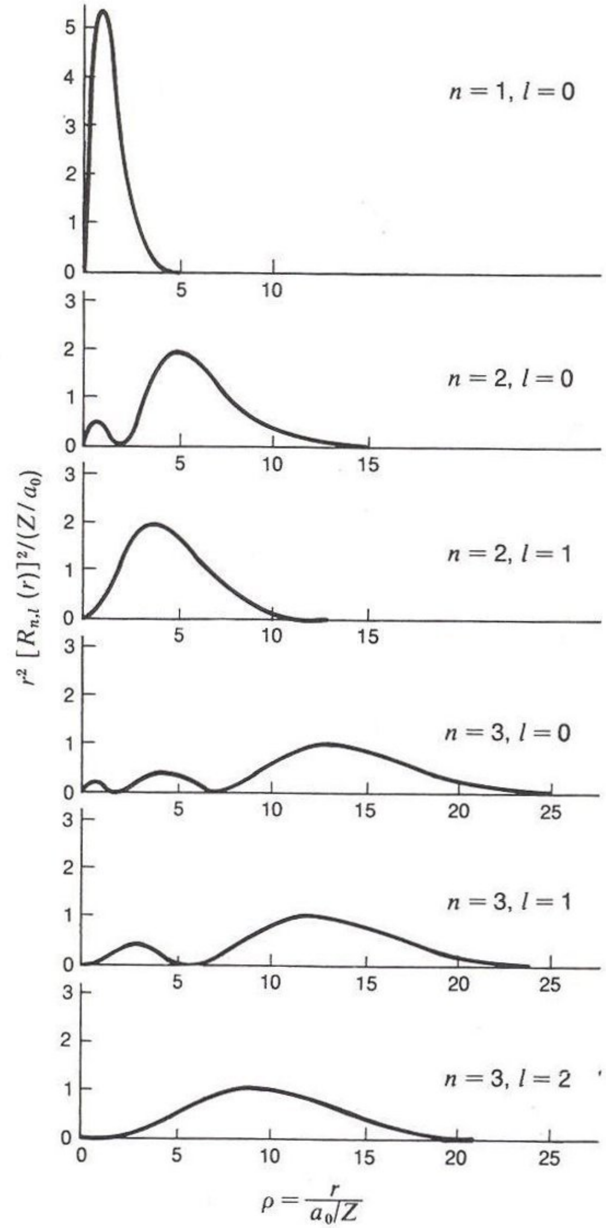
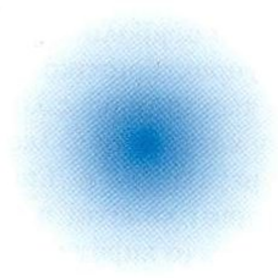
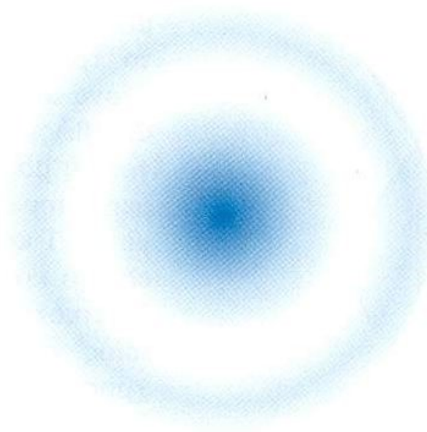


Fig. 12-5 Radial probability distribution for several states of hydrogen. [Note: *the horizontal axis is in Bohr radii for* Z = 1.]



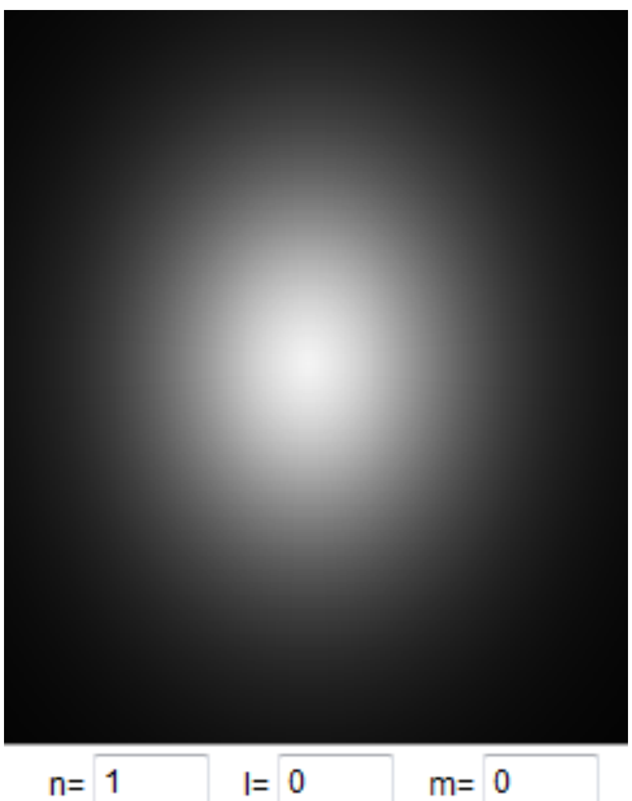
Τροχιακό 1s

$$\left(\psi_{1s} = \frac{1}{\sqrt{\pi}}\, e^{-r}\right)$$

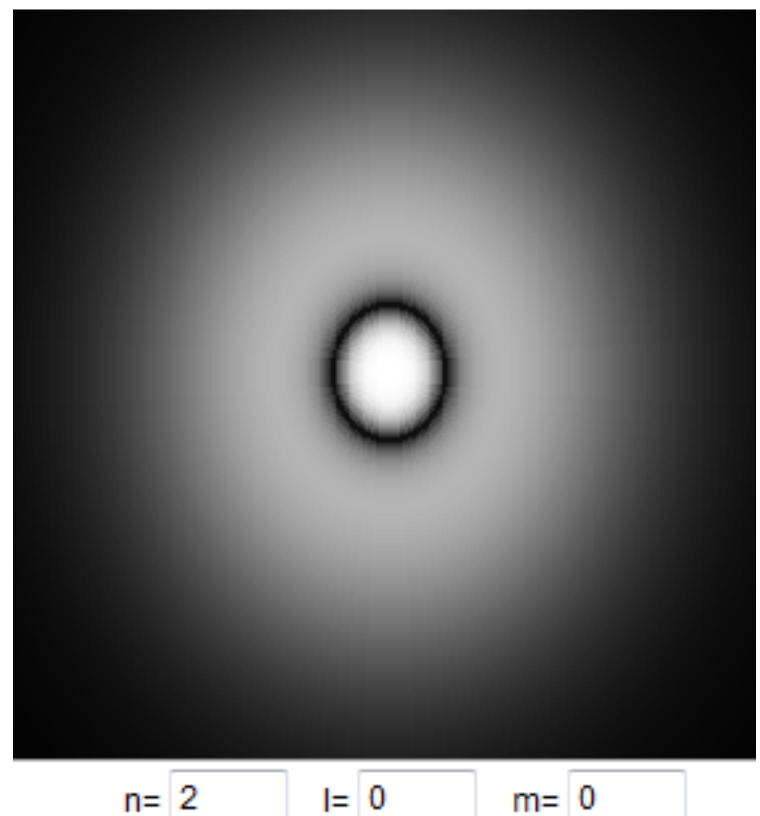


Τροχιακό 2s

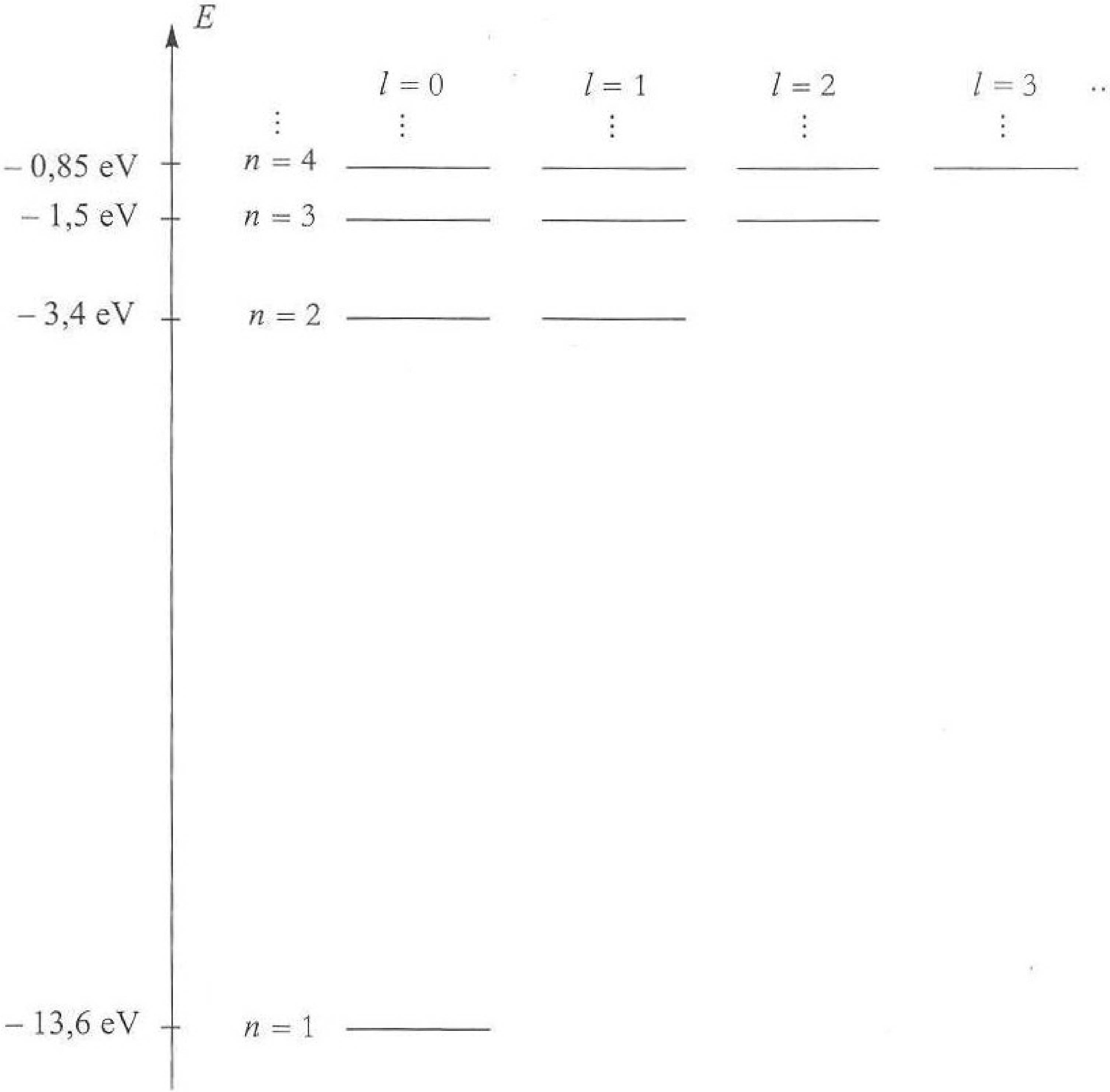
$$\left(\psi_{2s} = \frac{1}{2\sqrt{2\pi}}\left(1 - \frac{r}{2}\right)e^{-r/2}\right)$$



H 1S



H 2S



E
l = 0
l = 1
l = 2
l = 3
– 0,85 eV
n = 4
– 1,5 eV
n = 3
– 3,4 eV
n = 2
– 13,6 eV
n = 1

Group → / Period ↓	1	2	3		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																		2 He
2	3 Li	4 Be												5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg												13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc		22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y		40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	57 La	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	89 Ac	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
				*	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
				**	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	

$$1S \qquad \varphi_{100}(r,\theta,\phi) = \frac{2}{(a_0)^{\frac{3}{2}}} e^{-r/a_0} \Upsilon_0^{\ 0}(\theta,\phi)$$

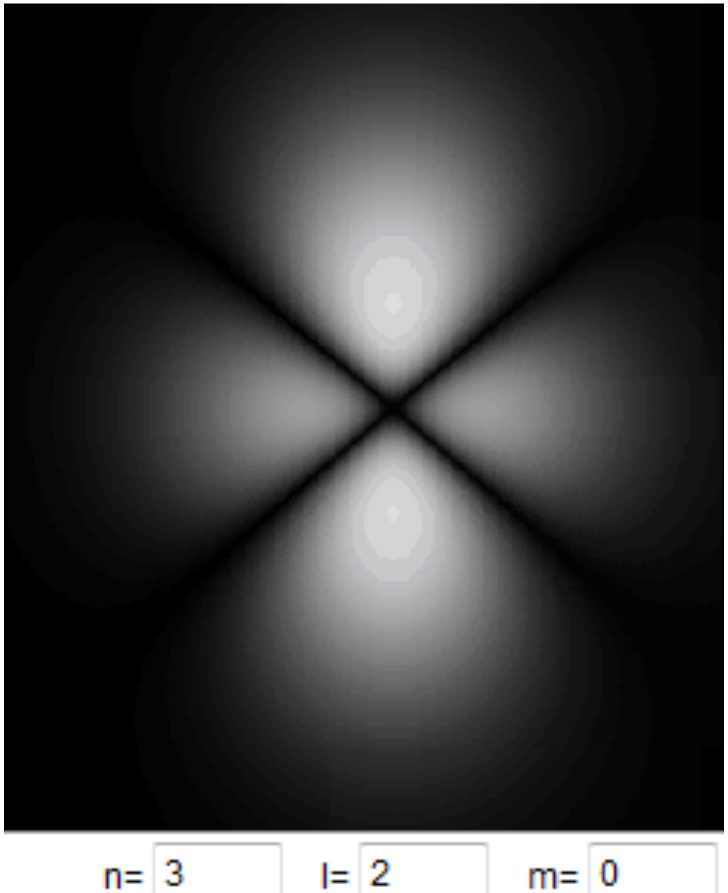
$$2S \qquad \varphi_{200}(r,\theta,\phi) = \frac{2}{(a_0)^{3/2}} \left(1 - \frac{r}{2a_0}\right) e^{-r/2a_0} \Upsilon_0^{\ 0}(\theta,\phi)$$

$$2P \qquad \left.\begin{matrix} \varphi_{211}(r,\theta,\phi) \\ \varphi_{210}(r,\theta,\phi) \\ \varphi_{21-1}(r,\theta,\phi) \end{matrix}\right\} = \frac{1}{\sqrt{3}(2a_0)^{3/2}} \frac{r}{a_0} e^{-r/2a_0} \left\{\begin{matrix} \Upsilon_1^{\ 1}(\theta,\phi) \\ \Upsilon_1^{\ 0}(\theta,\phi) \\ \Upsilon_1^{\ -1}(\theta,\phi) \end{matrix}\right.$$

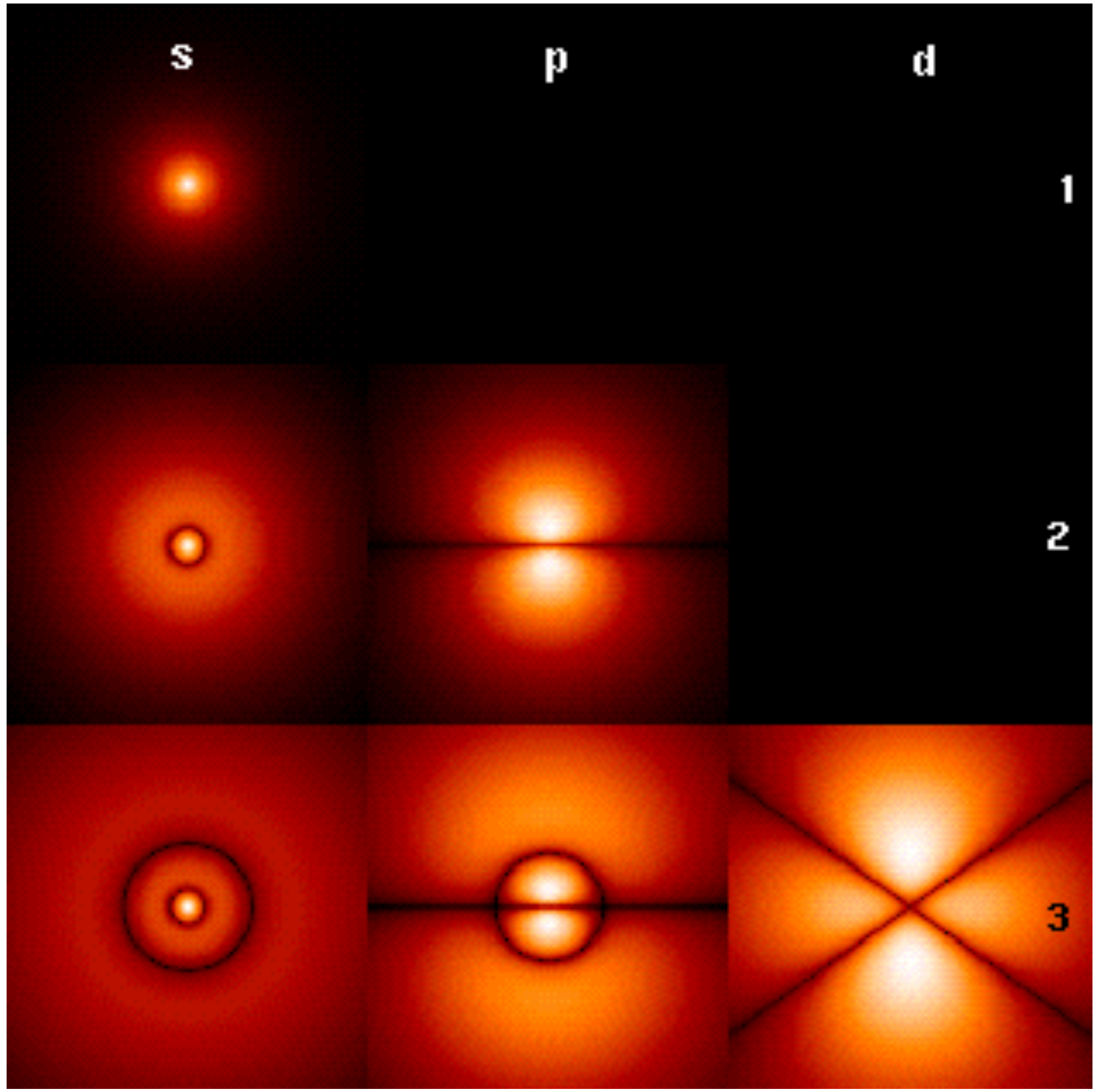
$$3S \qquad \varphi_{300}(r,\theta,\phi) = \frac{2}{3(3a_0)^{\frac{3}{2}}} \left\{3 - \frac{2r}{a_0} + 2\left(\frac{r}{3a_0}\right)^2\right\} e^{-r/3a_0} \Upsilon_0^{\ 0}(\theta,\phi)$$

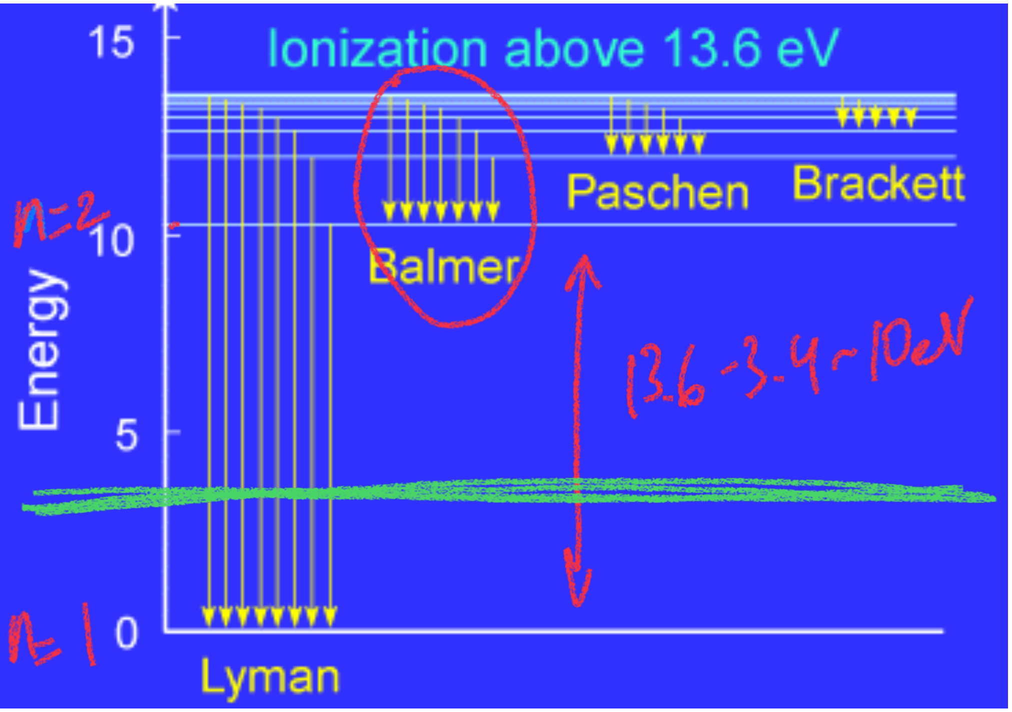
$$3P \qquad \left.\begin{matrix} \varphi_{311}(r,\theta,\phi) \\ \varphi_{310}(r,\theta,\phi) \\ \varphi_{31-1}(r,\theta,\phi) \end{matrix}\right\} = \frac{4\sqrt{2}}{9(3a_0)^{\frac{3}{2}}} \frac{r}{a_0} \left(1 - \frac{r}{6a_0}\right) e^{-r/3a_0} \left\{\begin{matrix} \Upsilon_1^{\ 1}(\theta,\phi) \\ \Upsilon_1^{\ 0}(\theta,\phi) \\ \Upsilon_1^{\ -1}(\theta,\phi) \end{matrix}\right.$$

$$3D \qquad \left.\begin{matrix} \varphi_{322}(r,\theta,\phi) \\ \varphi_{321}(r,\theta,\phi) \\ \varphi_{320}(r,\theta,\phi) \\ \varphi_{32-1}(r,\theta,\phi) \\ \varphi_{32-2}(r,\theta,\phi) \end{matrix}\right\} = \frac{2\sqrt{2}}{27\sqrt{5}(3a_0)^{\frac{3}{2}}} \left(\frac{r}{a_0}\right)^2 e^{-r/3a_0} \left\{\begin{matrix} \Upsilon_2^{\ 2}(\theta,\phi) \\ \Upsilon_2^{\ 1}(\theta,\phi) \\ \Upsilon_2^{\ 0}(\theta,\phi) \\ \Upsilon_2^{\ -1}(\theta,\phi) \\ \Upsilon_2^{\ -2}(\theta,\phi) \end{matrix}\right.$$

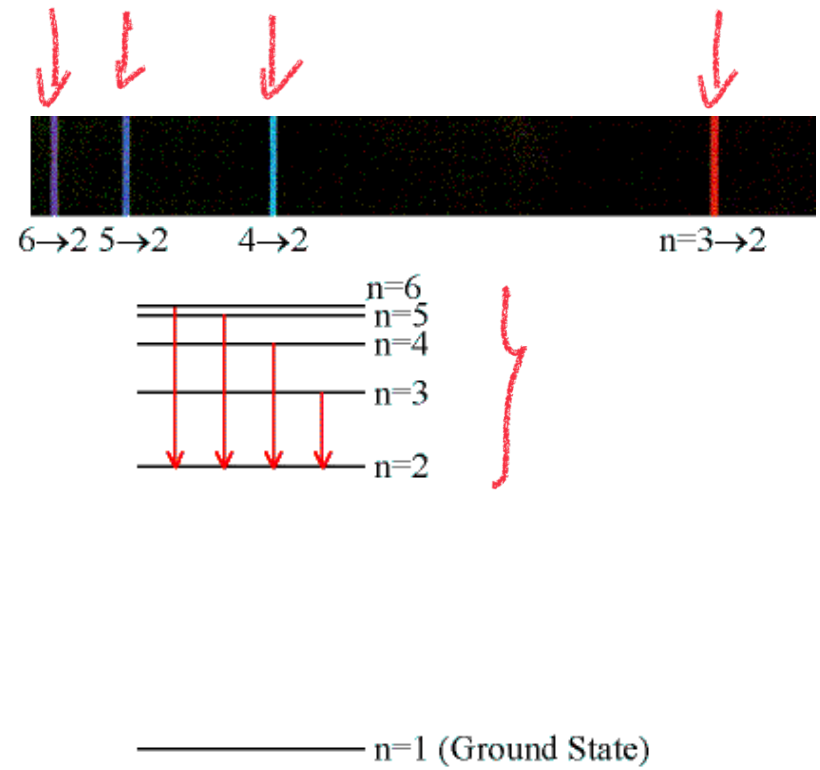


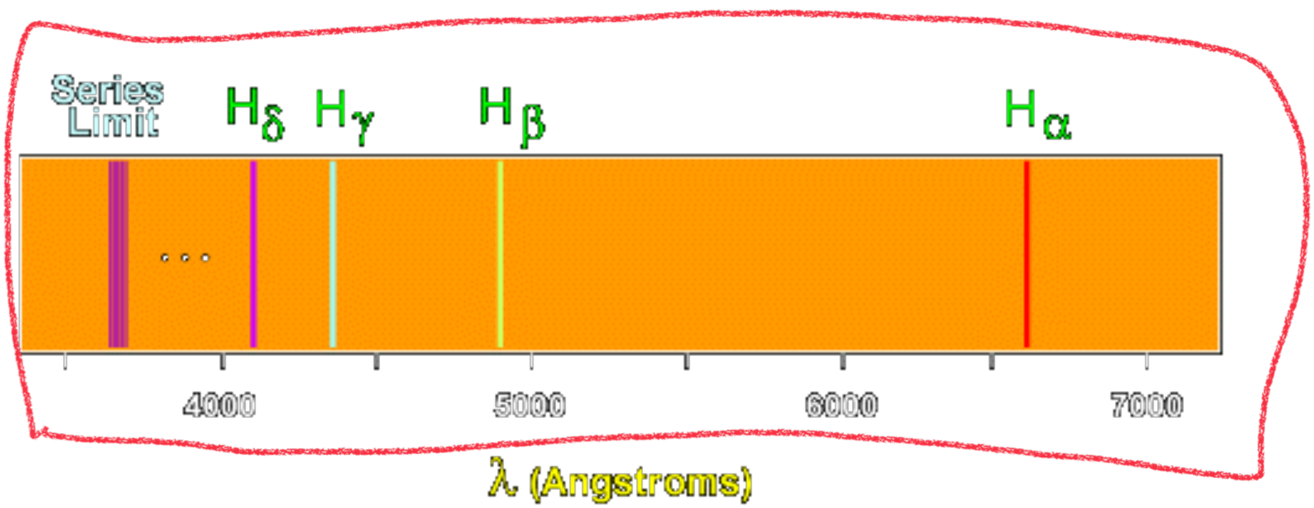
H 3D





Γραμμές Υδρογόνου





Γραμμές Balmer

$$i\hbar \frac{\partial \psi}{\partial t} = \hat{H}\psi$$