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O-I 1-4

S-I 1-8

$$\text{Power} = 40 \times 0.8$$

(1)

$$\frac{\cancel{\frac{4}{3}\pi} R_p^3}{\cancel{\frac{4}{3}\pi} R_{atom}^3} = \frac{(1.5 \times 10^{-15})^3}{(0.05 \times 10^{-9})^3}$$

(8)

$5000 \, A^\circ$

$$\frac{hc}{\lambda} \times N_A = \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{5000 \times 10^{-10}} \times N_A$$

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(7)

$\underline{330 \text{ Joule}} = h\nu \times N$

no. of photon

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$$mvr = \frac{nh}{2\pi} \quad — (1)$$

$$r = \frac{n^2h^2}{4\pi^2 K Ze^2 m} = 0.529 \frac{n^2}{Z} A^0$$

$$\frac{mv^2}{r} = \frac{KZe^2}{r^2} \quad — (2)$$

$$v = \frac{2\pi KZe^2}{nh} = 2.188 \times 10^6 \frac{Z}{n} \ m/sec$$

for H, He^+, Li^{2+} ← Single $\bar{e}$ system

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

$$KE = -TE$$

$$PE = 2T.E$$

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$$\text{Total Energy} = KE + PE$$

$$= \frac{1}{2}mv^2 - \frac{KZe^2}{r}$$

$$T.E = \frac{1}{2}\left(\frac{KZe^2}{r}\right) - \frac{KZe^2}{r}$$

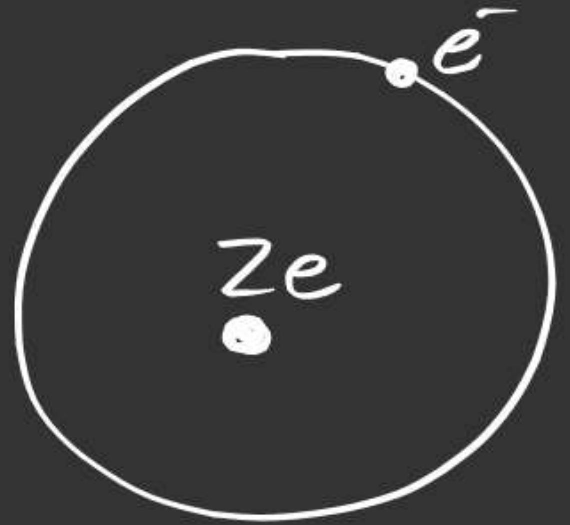
$$\boxed{KE = -TE}$$

$$\boxed{PE = 2T.E}$$

$$TE = -\frac{1}{2}\frac{KZe^2}{r}$$

$$\boxed{T.E = -\frac{2\pi^2 K^2 Z^2 e^4 m}{n^2 h^2}}$$

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



$$U_r = \frac{Kq_1q_2}{r} + \cancel{U_\infty} \xrightarrow{} 0$$

PE at r distance

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<u>frequency</u> (f) :- no. of round by e^- in 1 sec

$$f = \frac{v}{2\pi r} \qquad f \propto \frac{Z/n}{n^2/Z}$$

$$\propto Z^2/n^3$$

<u>Time period</u> (T) $= \dfrac{2\pi r}{v} = \dfrac{1}{f}$

$$T \propto n^3/Z^2$$

<u>Electrostatic force</u> $= \dfrac{KZe^2}{r^2} \propto \dfrac{Z \times Z^2}{n^4} = Z^3/n^4$

Q. find the expression of r, v & T.E if

(1) mass of e^- is increased to 2 times

(2) if charge of e^- & proton are increased to 2 times.

(1) Ans

$$r = \frac{0.529\, n^2/Z}{2}\ \text{Å}$$

$$v = 2.188 \times 10^6\, Z/n\ \text{m/sec}$$

$$T.E = -2 \times 13.6\, \frac{Z^2}{n^2}$$

$$r = \frac{n^2h^2}{4\pi^2 K Z e^2 m}$$

$$r = \frac{0.529\, n^2/Z}{4}$$

$$v = \frac{2\pi K Z e^2}{nh}$$

$$= 2.188 \times 10^6\, Z/n \times 4$$

$$TE = \frac{-2\pi^2 K^2 Z^2 e^4 m}{n^2h^2}$$

$$= -13.6\, Z^2/n^2 \times 16$$

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$r_{n,Z}$

Q find ratio of

① $\dfrac{r_{2,2}}{r_{1,1}}$ $\dfrac{2}{1}$

② $\dfrac{v_{2,1}}{v_{1,2}}$ $\dfrac{2/n}{2/1}$ $\dfrac{1}{4}$

③ $\dfrac{TE_{2,2}}{TE_{1,1}}$ Z^2/n^2

④ $\dfrac{KE_{2,1}}{KE_{1,1}}$ $\dfrac{1/4}{1/1}$

⑤ $\dfrac{PE_{1,3}}{PE_{3,1}}$ $\dfrac{9/1}{1/9}$

⑥ $\dfrac{f_{2,1}}{f_{1,1}}$ Z^2/n^3 $\dfrac{1/8}{1/1}$

⑦ $\dfrac{T_{2,2}}{T_{1,1}}$ n^3/Z^2 $= \dfrac{8/4}{1/1}$

⑧ $\dfrac{(\text{Electrostatic force})_{2,2}}{(\quad)_{1,1}}$ Z^3/n^4 $\dfrac{1}{2}$

⑨ $\dfrac{(\text{angular momentum})_{2,1}}{(\quad)_{1,1}}$ $\dfrac{\cancel{9}}{1}$

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$$mvr = \frac{nh}{2\pi}$$

$$\propto \frac{Z}{n} \quad \frac{n^2}{Z}$$

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$$TE = -13.6\, Z^2/n^2$$

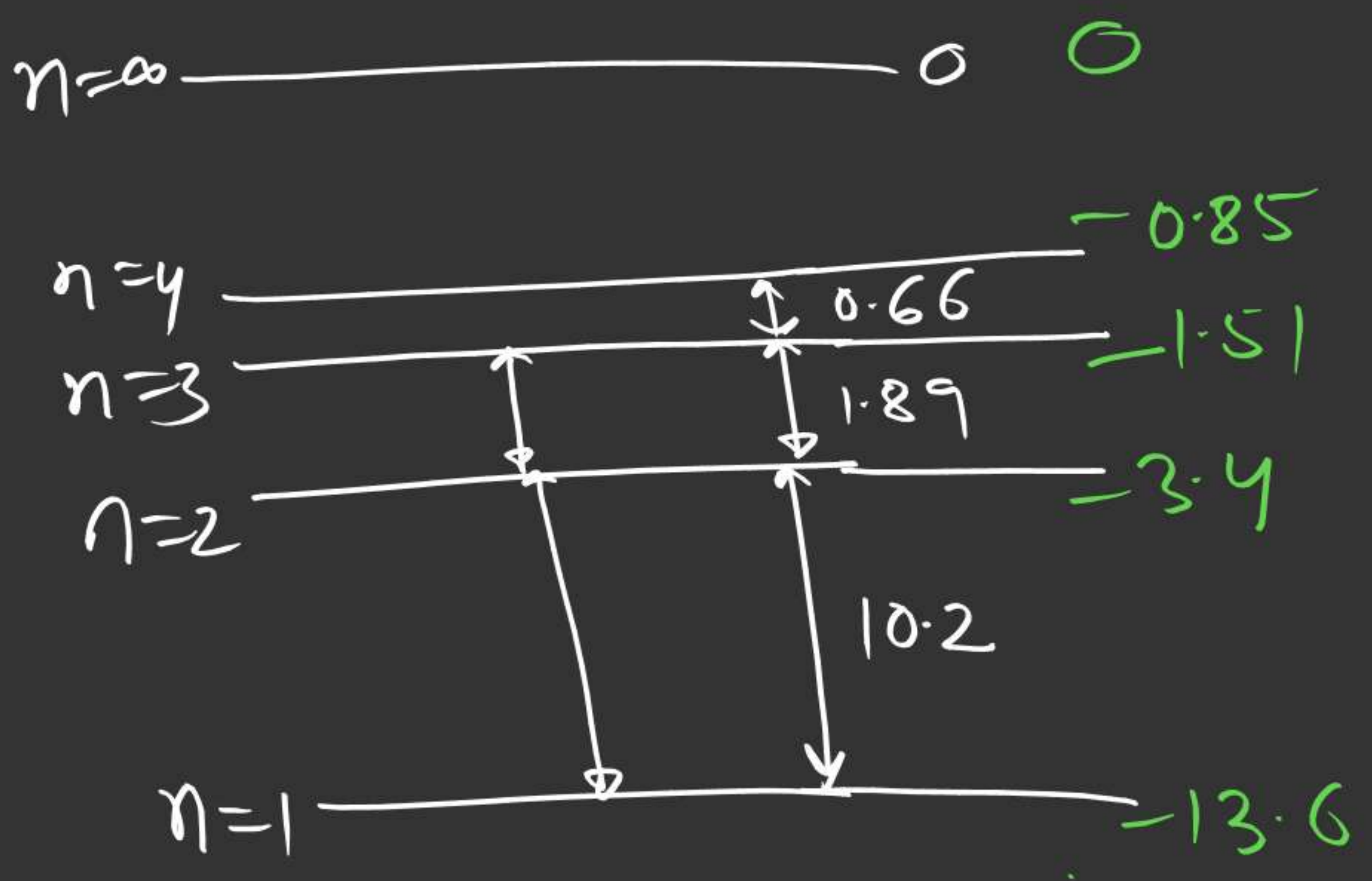
$n = \infty \quad TE = 0$

	TE of H	TE of He^+
$n=1$	-13.6	-54.4
	10.2	
$n=2$	-3.4	-13.6
	1.89	
$n=3$	-1.51	-6.04
	0.66	
$n=4$	-0.85	-3.4
	0.31	
$n=5$	-0.54	-2.16
		-1.51

$$T.E = -13.6\,\frac{Z^2}{n^2}$$

	'H'	He^+	Li^{2+}
$n=1$	1	2	3
$n=2$	2	4	6
$n=3$	3	6	9

$$E_2 - E_1 > E_3 - E_2 > E_4 - E_3 > E_5 - E_4$$



$$E_2 - E_1 > E_\infty - E_2$$

$$= 10.2 \qquad = 3.4$$

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find Energy of photon emitted when an e^- jumps from

1. $2 \rightarrow 1$ in 'H' atom
2. $3 \rightarrow 2$ in "
3. $3 \rightarrow 1$ in "
4. $2 - 1$ in He^+
5. $3 - 1$ in He^+

$$\boxed{\begin{array}{ll} \text{O - I} & 5 - 11 \\ \text{S - I} & 9 - 16 \end{array}}$$