# Problems on Bohr Model

Course on Atomic Structure for Class XI

**akhilesh** • Lesson 7 • Sept 3, 2021

IE = 10 eV  10 volt

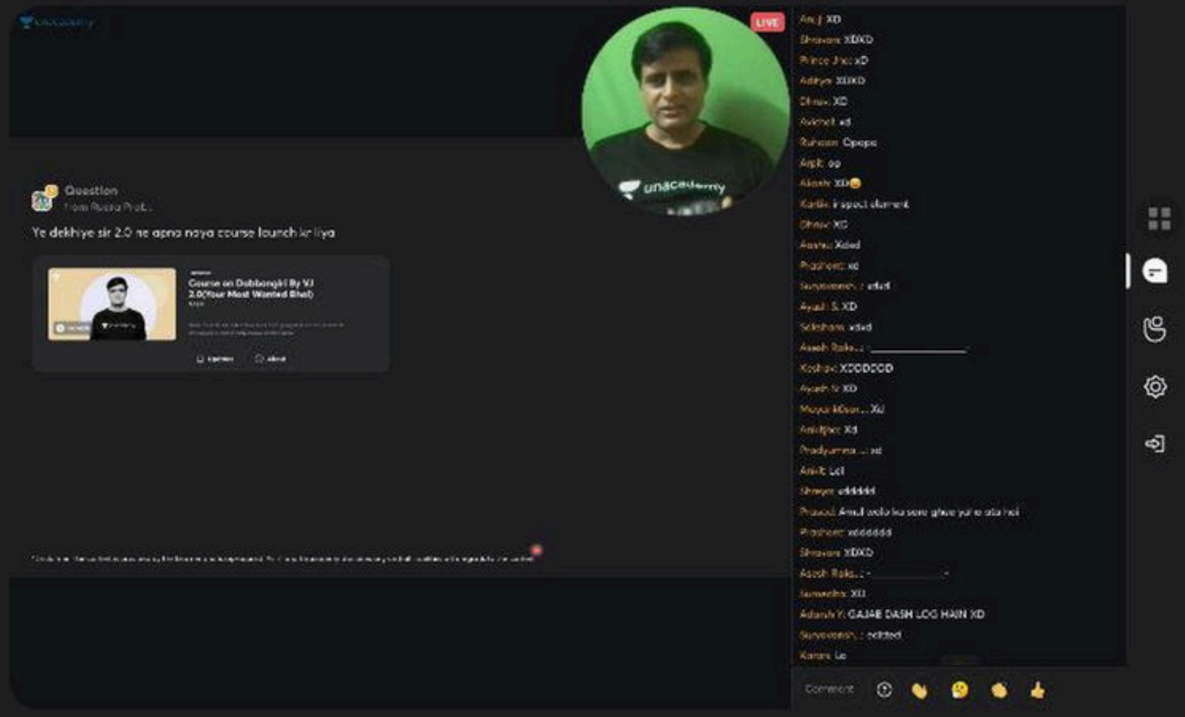
## Question

from Suryavansh...

Please help me with this doubt

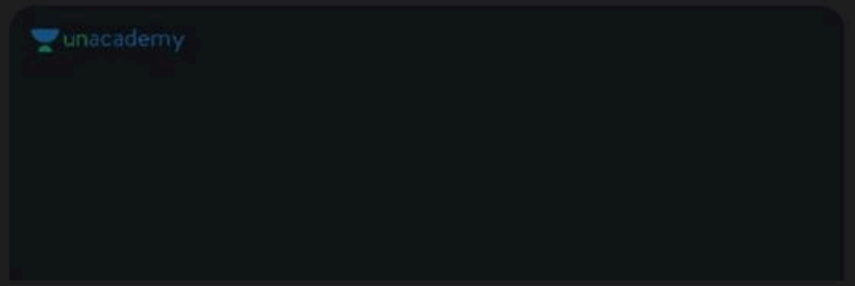
## Question
from Rachit

Please help me with this doubt



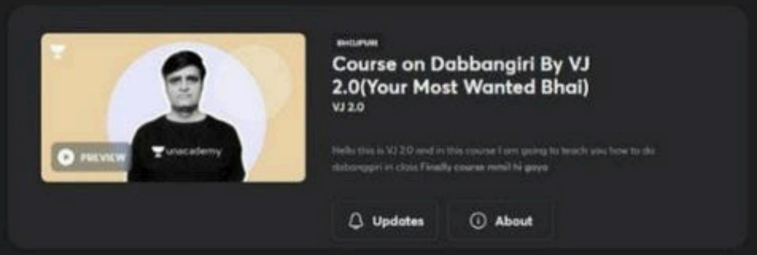
## Question
from Rachit

Please help me with this doubt



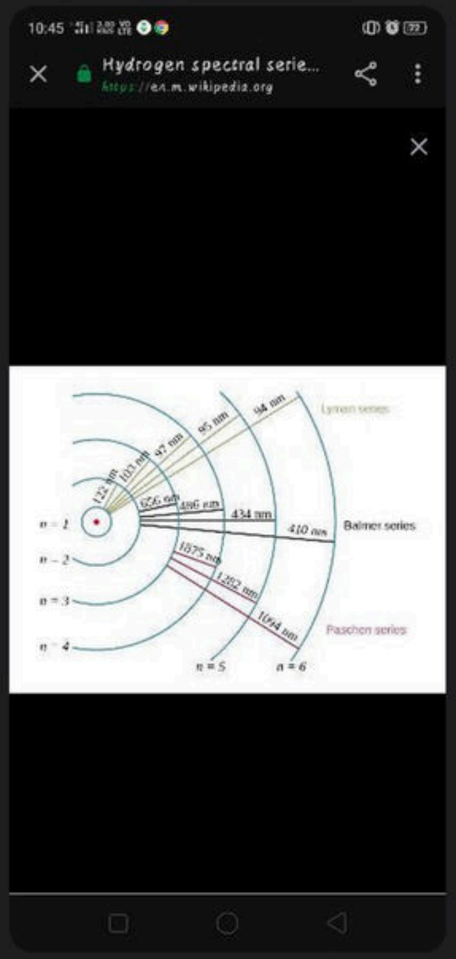

## Question
from Rudra Prat...

Ye dekhiye sir 2.0 ne apna naya course launch kr liya



## Question
from RAKSHIT

Please help me with this doubt



**Question**
from Ram

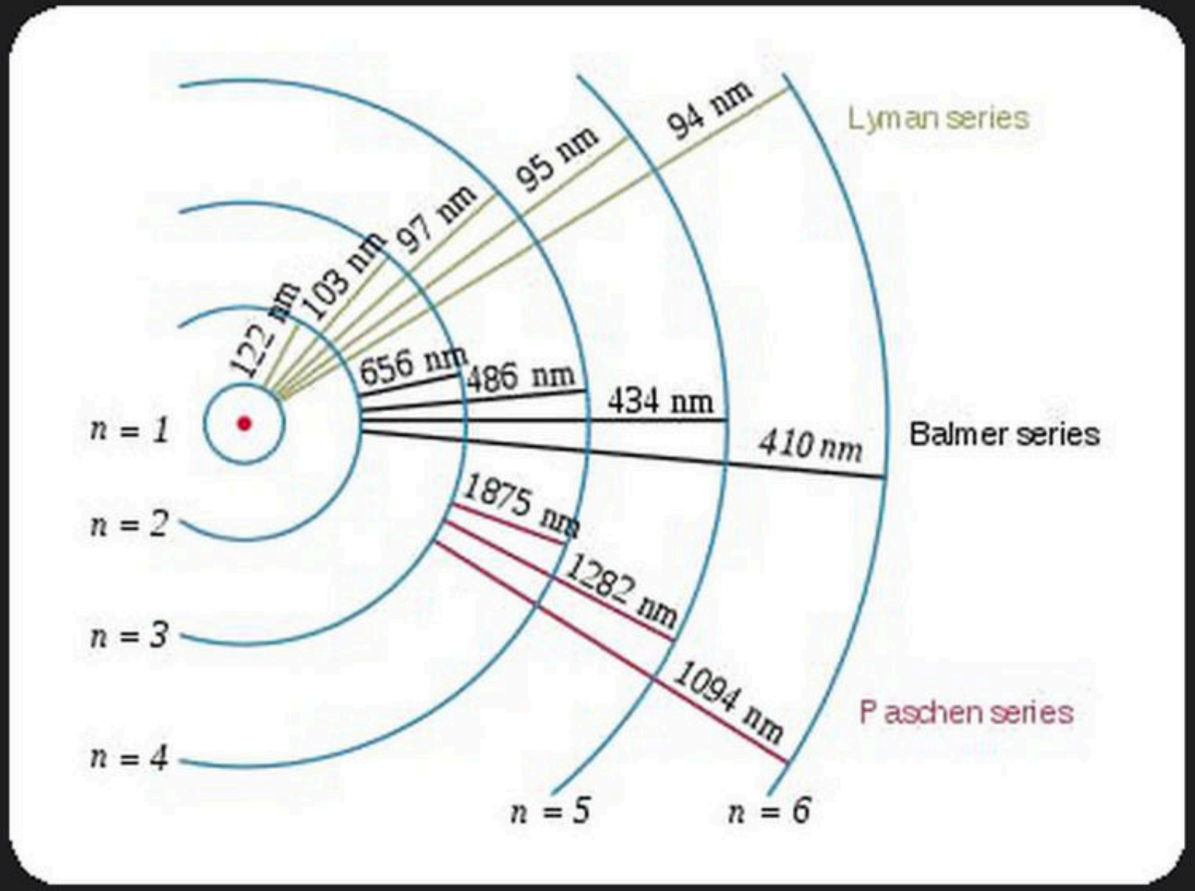
what will be 'n' of electron moving from 2 to 6 in exited state?

$6 \longrightarrow 2$

$$= \frac{n(n-1)}{2} = \frac{5 \times 4}{2}$$

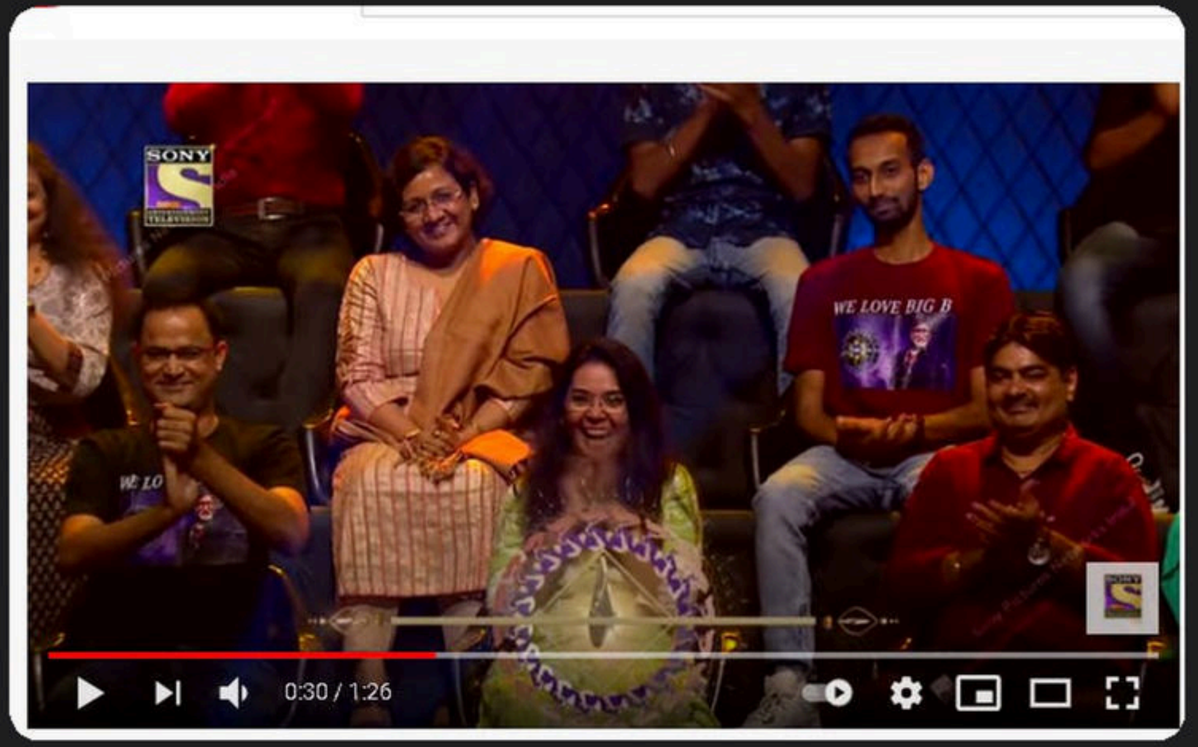
**Question**
from ARNAVGUPTA

Please help me with this doubt



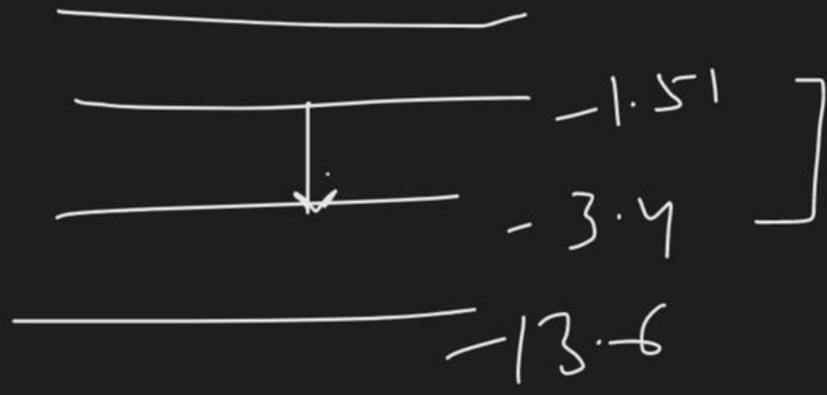
## Question
from Shravan

Please help me with this doubt



28) $\frac{v}{2\pi r} \times 10^{-8}$

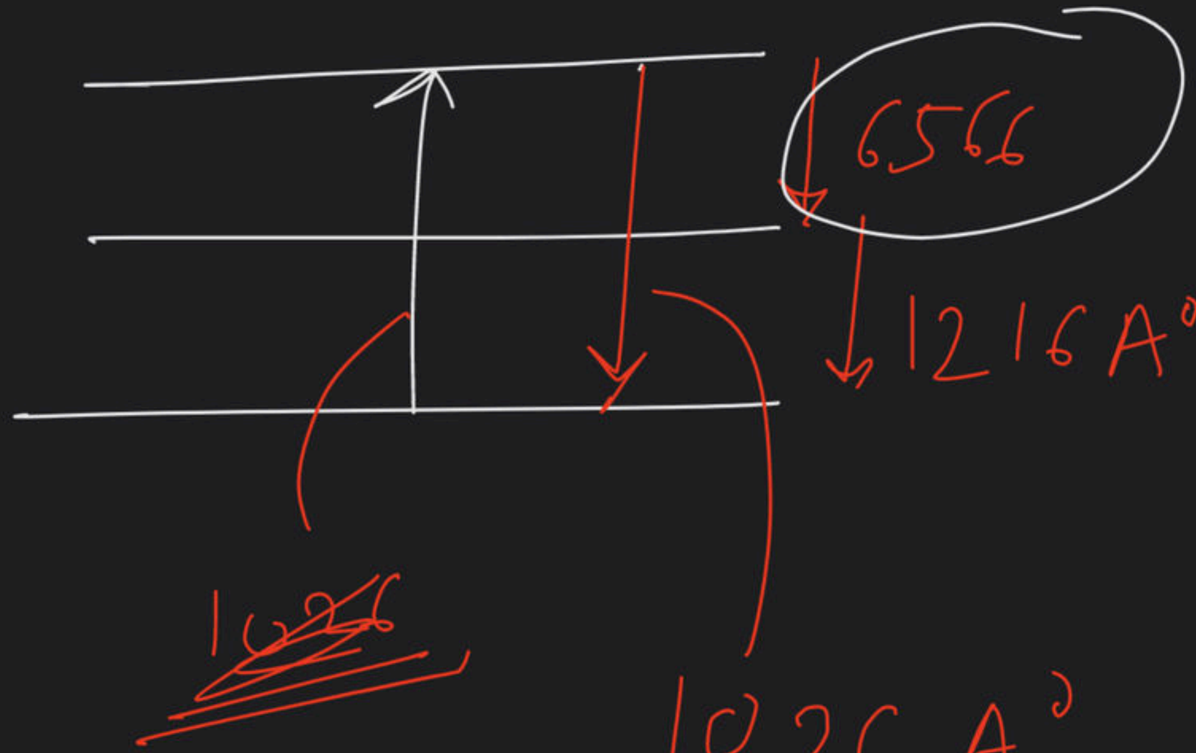
31)




] 1.89 eV × $N_A$

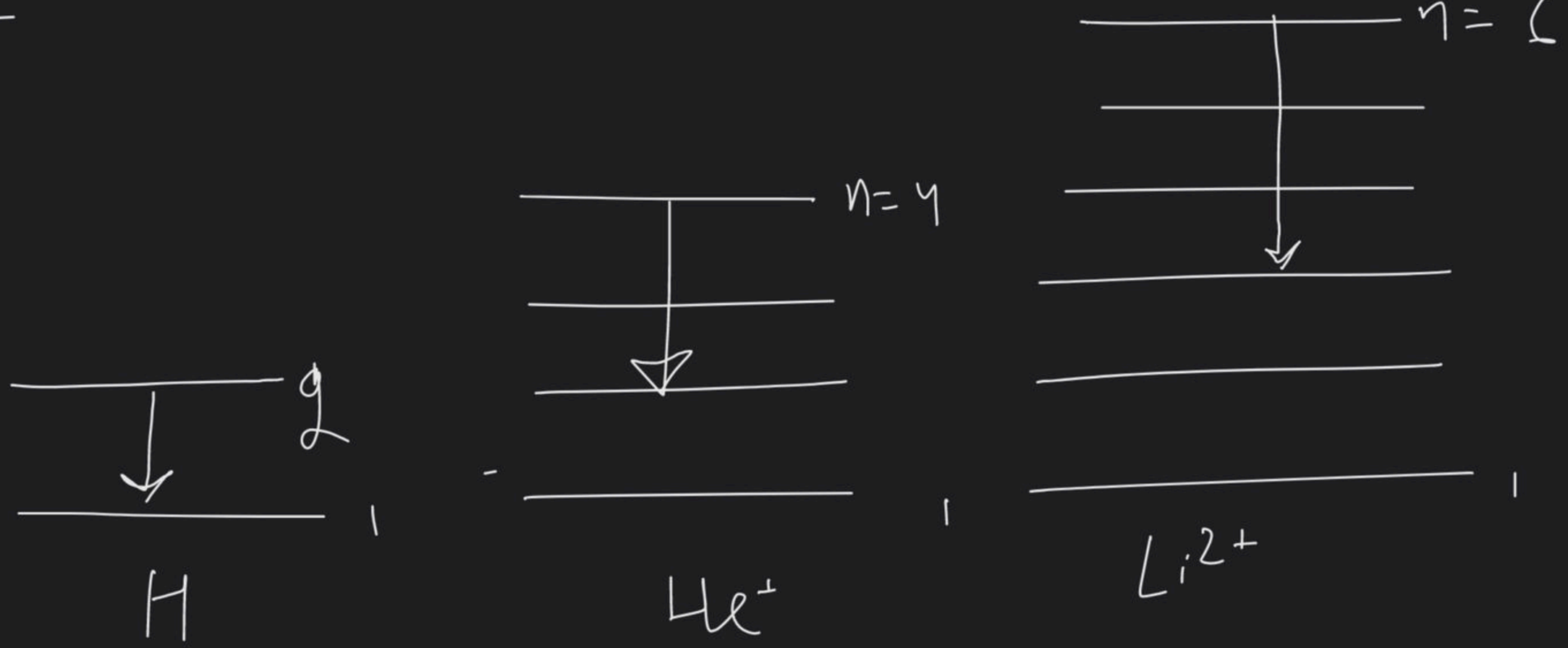
$1.89 \times 1.6 \times 10^{-19}$ J × $6.02 \times 10^{23}$

(32) $1026 = \lambda$ $\quad E = \frac{1240 \text{ nm eV}}{1026}$




$= 12.08$

35



$He^{+}$

~~2 — 1~~

$3 - 2$

$4 - 2$

$6 - 2$

$6 - 4$

$Li^{2+}$

~~3 — 1.5~~

$4.5 - 3 \times$

$$\begin{bmatrix} 6 - 3 \\ 9 - 3 \\ 9 - 6 \end{bmatrix}$$

$n_2$

$n_1$

$n = 1$

0.6375

0.85

0.28

13.6

3.4

1.51

0.85

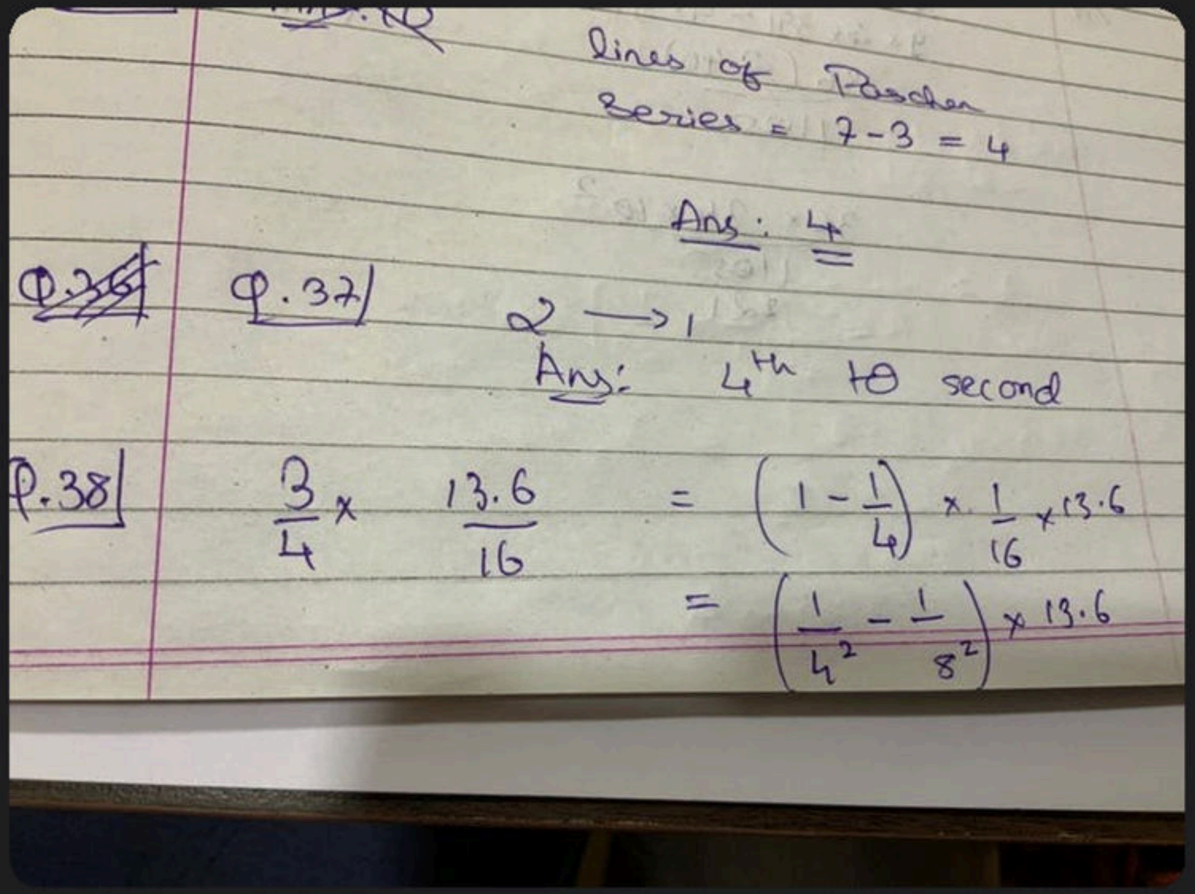
0.54

0.38

0.61

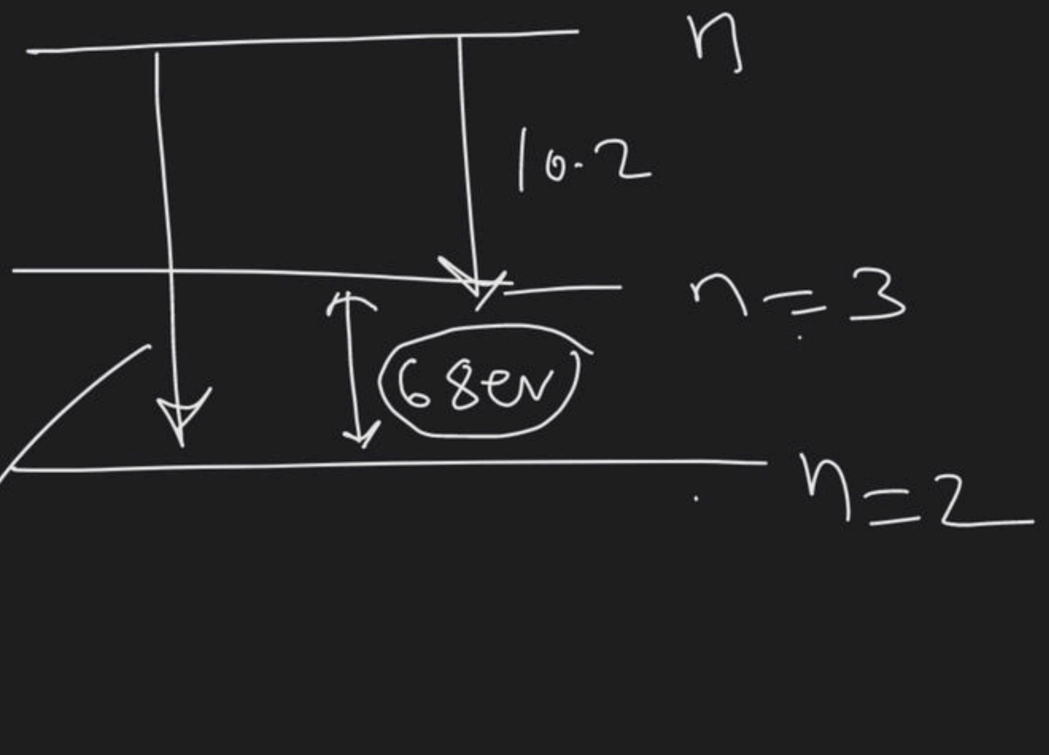
**Question**
from Ridham

Please help me with this doubt




$$0.6375 = \frac{3}{4} \times 0.85$$

$$0.6375 = \left( \frac{3}{4} \times \frac{13.6}{16} \right)$$




$$6.8\,eV = 13.6\,Z^2\left[\frac{1}{2^2} - \frac{1}{3^2}\right]$$

$$mvr = J$$

(29) $$\frac{1}{\lambda} = R_H \times \left[\frac{1}{1} - \frac{1}{4}\right]$$

$$\frac{1}{\lambda_2} = R_H \left(\frac{1}{1} - \frac{1}{9}\right)$$

$$\lambda_{3rd} = \frac{1}{R_H} \times \frac{16}{15}$$

$$\lambda_{1st} = \frac{1}{R_H} \times \frac{4}{3}$$

$$\lambda_{2nd} = \frac{1}{R_H} \frac{9}{8}$$

(28) $He^{+}$ $Z=2$

$\infty \rightarrow 2$

$$\frac{1}{\lambda} = R_H \times 4 \left[\frac{1}{4} - \frac{1}{\infty}\right]$$

$$\lambda = \frac{1}{R_H}$$

$Z=3$

$4-3$

$$\frac{1}{\lambda} = \frac{1}{\lambda} \times 9 \left[\frac{7}{9 \times 16}\right.$$

$$\lambda = \frac{16\lambda}{7}$$

31

$n = 4$ $-0.85$ 13

$KE = 12.15$

**Question**
from Arsh

SIR TOTAL ENERGY KE FORMULA ME ENERGY N^2 KE INVERSE PROPORTIONAL HAI  MTLB ENERGY OF SHELL DEC HOTI HAI MOVING OUTWARD.....PR GOOGLE ETC. PE ISKA ULTA BATATA HAI.....

$$-13.6 \times \frac{Z^2}{n^2}$$

Q. Considering Bohr quantization of angular momentum to applicable to our solar system (Assuming single planet syste 1.e. earth) find radius, speed & T.E of possible orbits

M m

$$r = \frac{n^2h^2}{4\pi^2 GMm^2}$$

$$v = \frac{2\pi GMm}{nh}$$

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

$$\frac{mv^2}{r} = \frac{GMm}{r^2}$$

$$\frac{m}{r}\left(\frac{n^2h^2}{4\pi^2 m^2 r^2}\right) = \frac{GMm}{r^2}$$

$$T.E = \frac{1}{2}mv^2 - \frac{GMm}{r} = -\frac{1}{2}\frac{GMm}{r}$$

$$\underline{T.E} = -\frac{GMm}{2} \times \frac{4\pi^2 GMm^2}{n^2h^2}$$

Q. In a hypothetical H-like atom PE of the system is given by $k \ln r$. find Exp. for $r$, $v$ & T.E. using Bohr quantization of angular momentum.

$$F = -\frac{dV}{dr}$$

$$F = -\frac{k}{r}$$

$$\frac{mv^2}{r} = \frac{k}{r}$$

$$v = \sqrt{\frac{k}{m}}$$

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

$$m\sqrt{\frac{k}{m}}\, r = \frac{nh}{2\pi}$$

$$r = \frac{nh}{2\pi\sqrt{km}}$$

$$T.E = \frac{1}{2}mv^2 + k\ln r$$

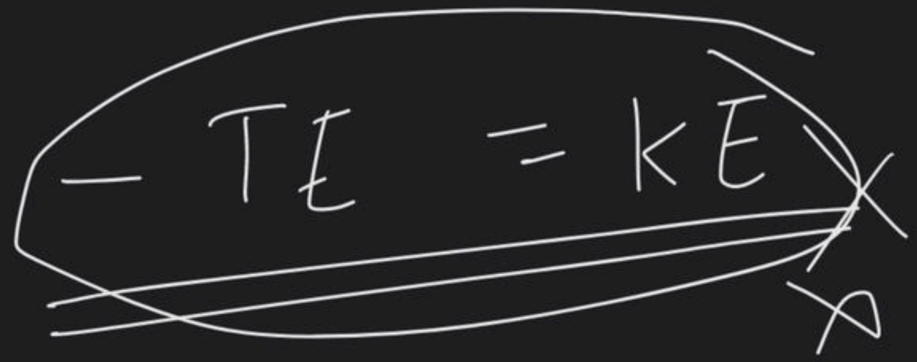
$$= \frac{k}{2} + k\ln\frac{nh}{2\pi\sqrt{km}}$$

$$PE = -\frac{kq_1q_2}{r} \qquad -\frac{GMm}{r}$$

$r \uparrow \quad PE \uparrow \qquad r \uparrow \quad PE \uparrow$

$$PE = k \ln r \qquad F = -\frac{dV}{dr}$$

$r \uparrow \quad PE \uparrow$




= k ln Ω

k −

# Drawback of Bohr Model :→

1.) It is applicable to single $e^-$ system

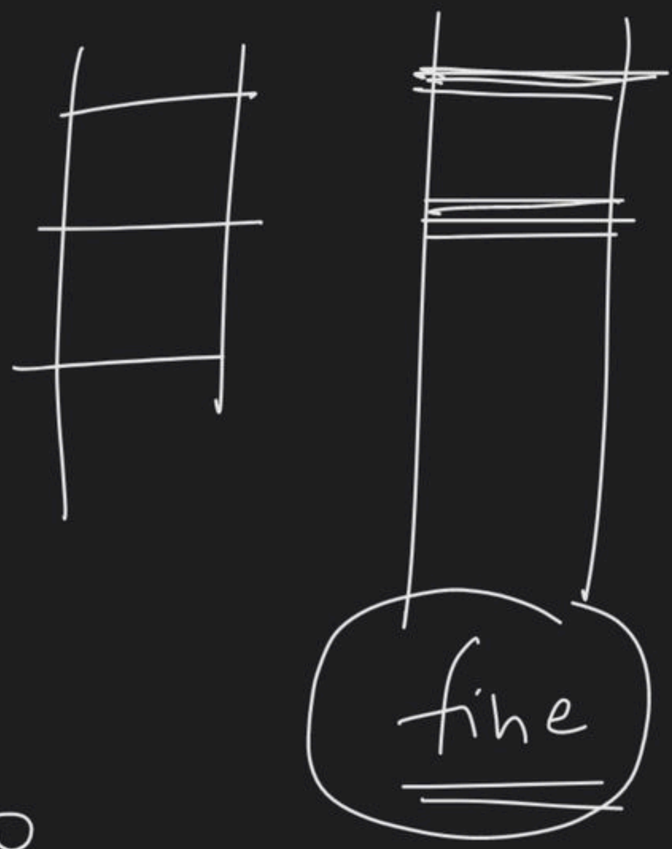
2) In a stationary orbit $e^-$ does not lose energy whereas as per Maxwell theory it should.

3) No derivation / explaination was given for Bohr quantization of angular momentum.

(4) K L M N

$n=3$

3S 3p 3d




(4) Bohr Model failed to explain fine spectrum (Band) of atoms which leads to existence of subshell in

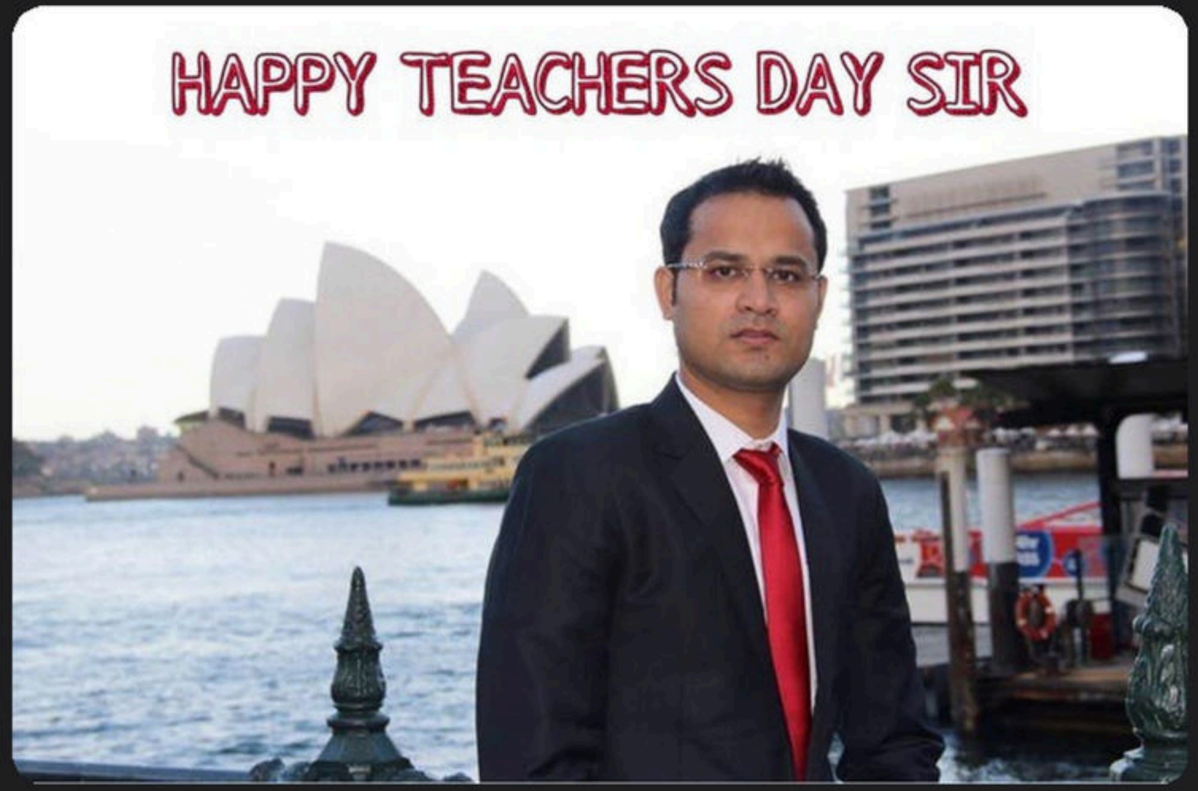
(5) Bohr Model failed to explain splitting of spectral lines in the presence of electric field (Stark effect) and in a magnetic field (Zeeman effect).

(6) It could not explain the ability of atoms to form molecules by chemical bonds.

S-2 1-8

**Question**
from Ridham

Happy teachers day sir



**Question**

from Ansh

HAPPY TECHERS DAY SIR....HMESHA APNA ASHIRWAD
BNAY RAKHIYEGA

## Question
from ASHMIT

happy paryushan parv sir.....

## Question
from tavyan

Please help me with this doubt

Class 11 » Chemistry » Structure of Atom » Bohr's Model for Hydrogen Atom » When an elec...

### Question

When an electron in hydrogen atom, jumps from $n = 6$ to $n = 2$ energy level then maximum number of possible spectral lines are equal to

$$\frac{d}{dx} \ln x = \frac{1}{x}$$