Spectral Line

Course on Atomic Structure for Class XI

akhilesh • Lesson 6 • Sept 1, 2021

(19) $\frac{3 \times 10^8}{275} = 2.188 \times 10^6 \times \frac{Z}{n}$

$n = 2$

(22) $KE = \frac{13.6}{n^2} Z^2$

$\log KE = \log \frac{13.6}{n^2} + 2 \log Z$

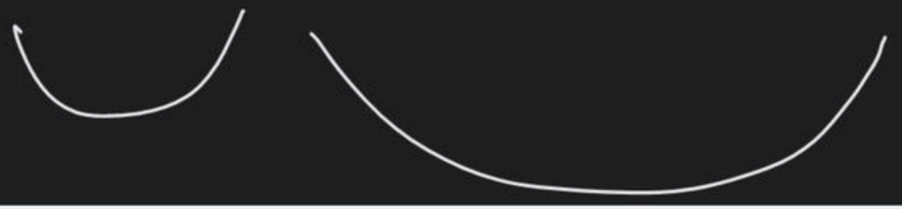
(24) $\uparrow E_1 = 16$

$\Delta E = -16 \left(\frac{1}{n^2}\right)$ $\quad 1 \longrightarrow 2$

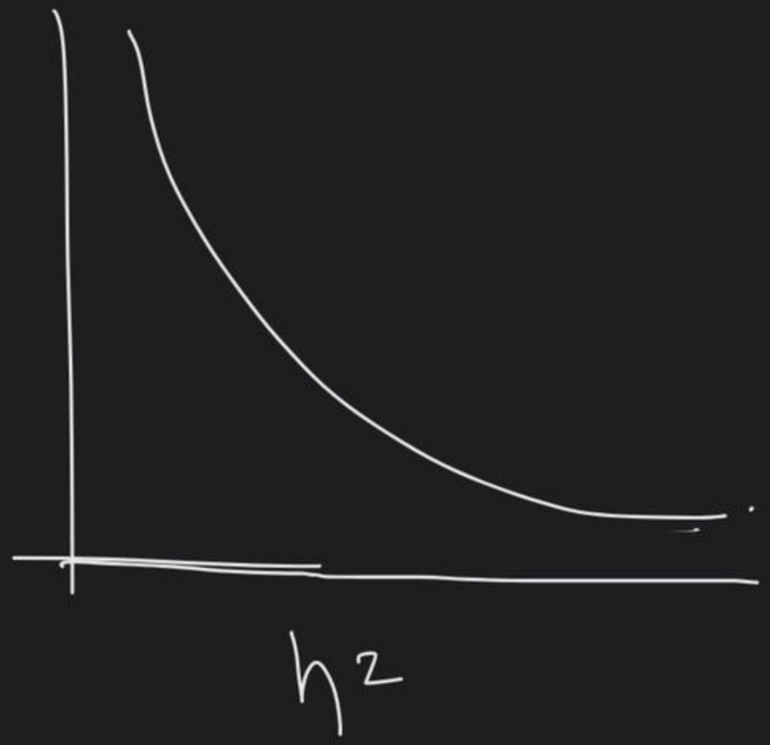
12

(5) K L M N

n=1 2 3 4



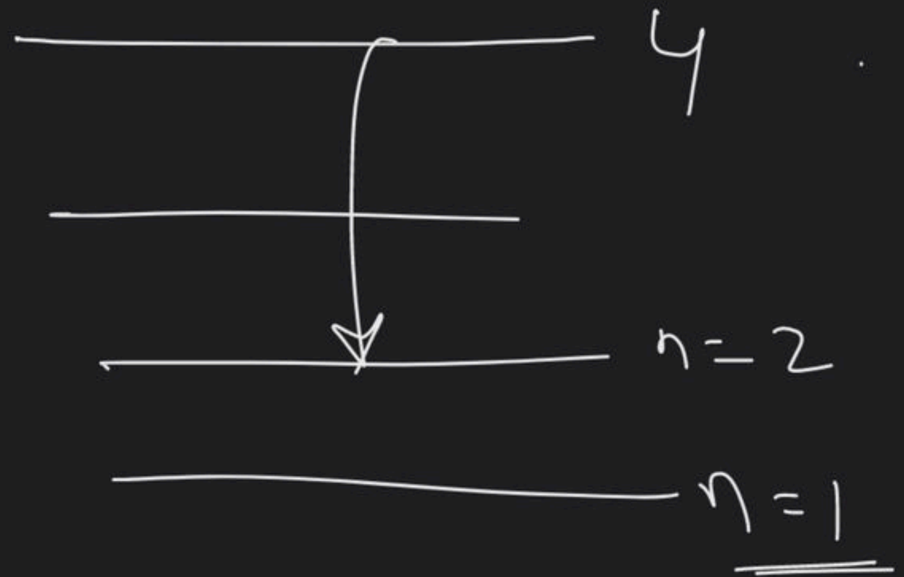
(c)



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

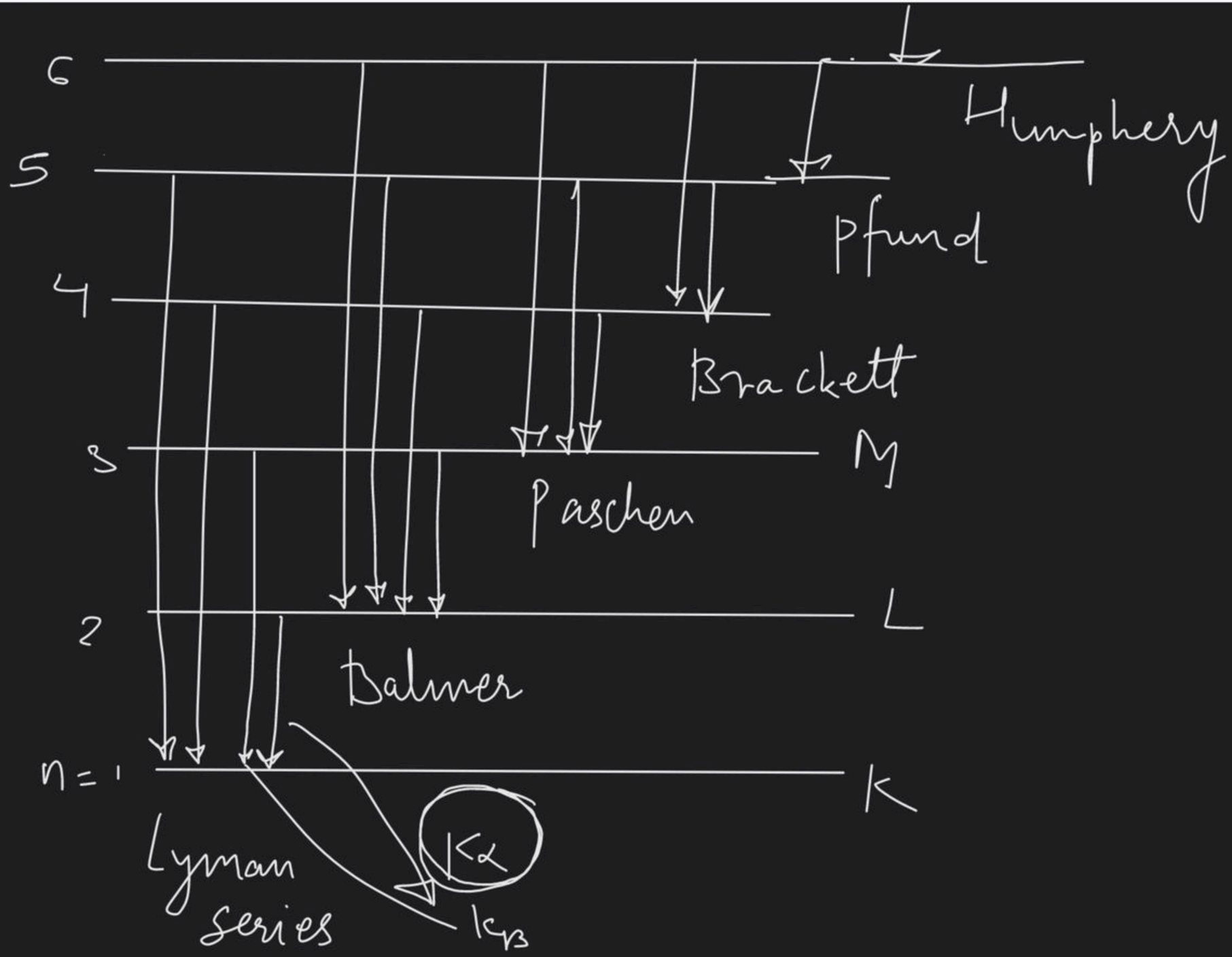
$E_n \times Z^2$

16



14

-1.51


6
5
4
3
2
n = 1
Humphery
Pfund
Brackett
Paschen
Balmer
Lyman series
Kα
Kβ
N
L
K

Lyman Series :—

$n_1 = 1$ $\quad$ $n_2 = 2, 3, 4 - - \ldots$

$2 \to 1$ $\quad$ 1st line → line of minimum energy (K_α)

$\infty \to 1$ $\quad$ Last line → line of max energy
→ line of max frequency
→ line of min λ

for H-atom

$$\lambda_{1st} = \frac{912 \times 4}{3} = 1216\,A^\circ$$

$$\frac{1}{\lambda_{1st}} = \frac{1}{912} \times 1\left[\frac{1}{1^2} - \frac{1}{2^2}\right]$$

$$\lambda_{last} = 912\,A^\circ$$

for H-atom Lyman Series radiation lies in U.V range ✓

② Balmer Series

for H-atom

$n_1 = 2$

$n_2 = 3, 4, 5, 6, 7$

$\lambda_{1st} = 6566$ ✓

$\lambda_{2nd} = 4864$ ✓

$\lambda_{3rd} = 4342$ ✓

$\lambda_{4th} = 4104$ ✓

first four lines of balmer series lies in visible range of spectrum

$\lambda_{5th} = 3972$

$\lambda_{last} = 3648$

Paschen Series

$n_1 = 3$

$n_2 = 4, 5, \ldots$

$\lambda_{1st} = 18761\ A^\circ$

$\lambda_{last} = 8208\ A^\circ$

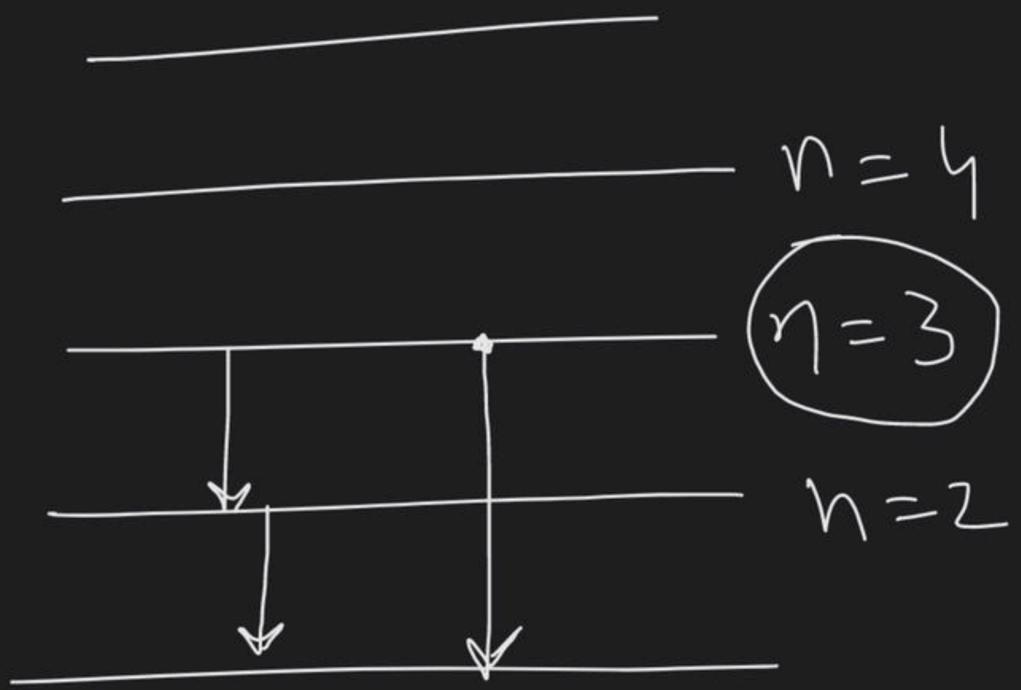
$$\frac{1}{\lambda} = R_H\left[\frac{1}{3^2} - \frac{1}{4^2}\right]$$

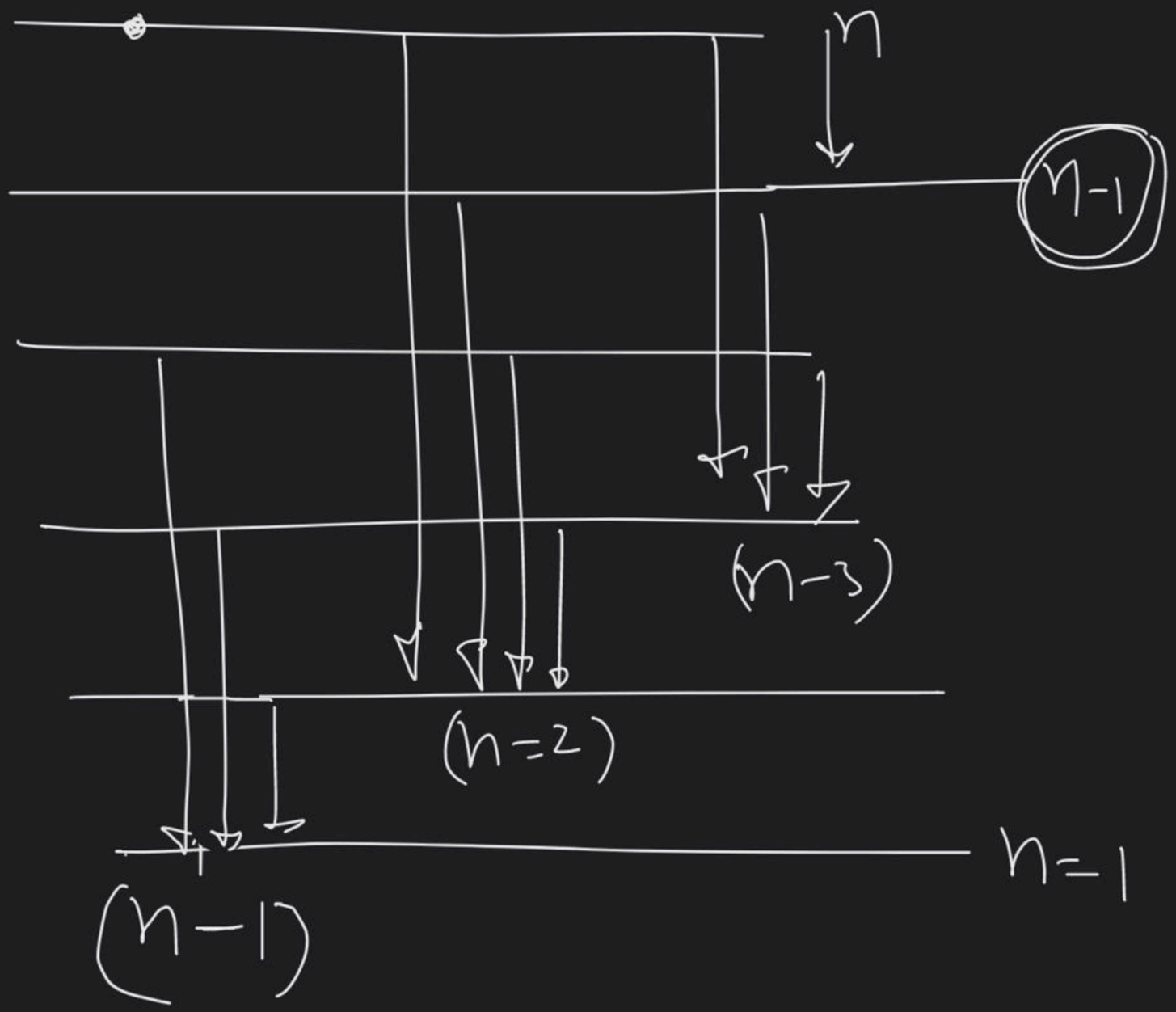
$$\lambda = \frac{912 \times 9 \times 16}{7}$$

Ans — 3

Infrared

No. of Spectral lines :→




n
n-1
(n-3)
(n=2)
n=1
(n-1)

$$(n-1) + (n-2) + (n-3) - - - - - 2 + 1$$

Total lines $= 1 + 2 - - - - (n-1)$

Total lines $= \frac{(n-1)\,n}{2}$

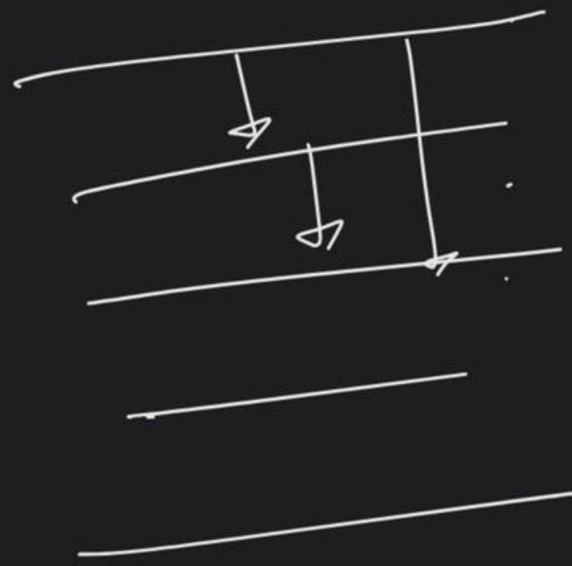
$n = 4$ no. of special $= 6$

$n = 5$ " $= 10$

$n = 6$ " $= 15$

$n =$ no. of energy level involved

$= n_2 - n_1 + 1$



$= \frac{3 \times (3-1)}{2} = 3$

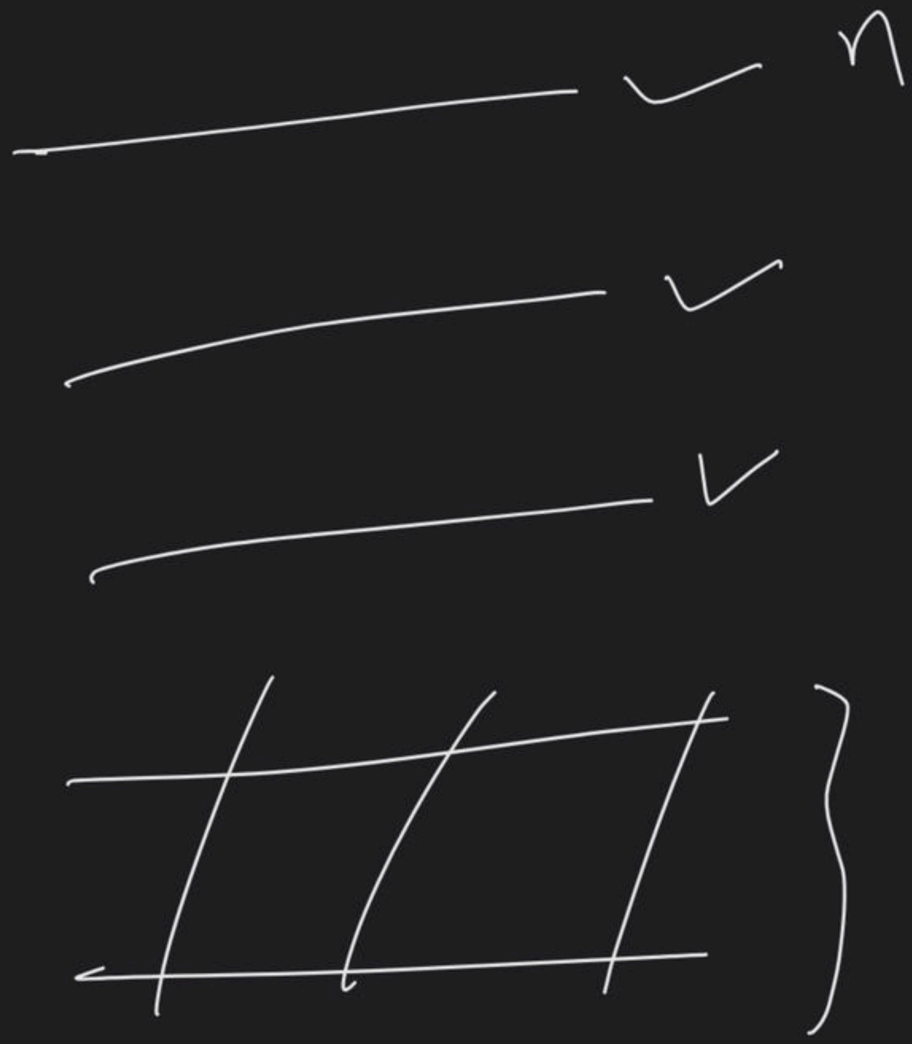
Q. An e^- jumps from $n=6$ to ground level find no. of balmer lines = 4

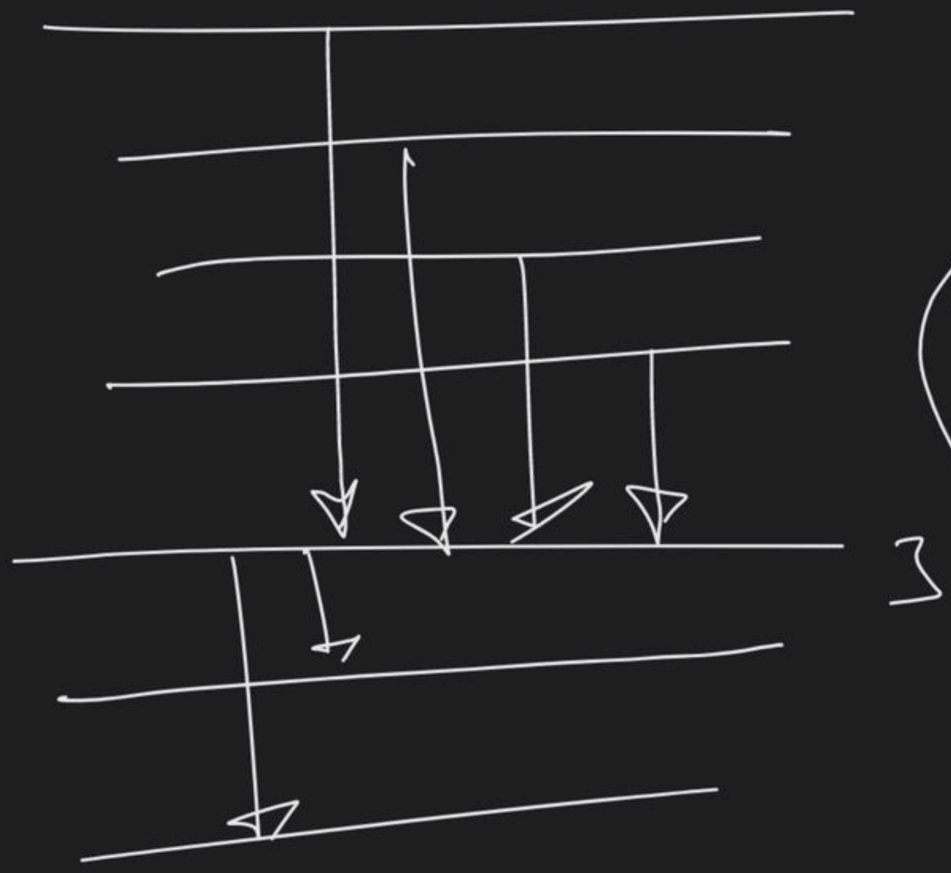
Paschen line = 3

Total lines = 15

Q. In a sample of H-like atom e^- is present in $n=7$ level and returns to ground level without emitting any lines of Paschen series find Total lines emitted.

(A) 11
(B) 17
(C) 15
(D) None





21-6
=15

S-1 27 — 39

0-1 21 — 35

17 pure V.pr depend on Temp

Liquid Soln

a, b

41 (B) A & B

50. Isotherms of carbon dioxide at various temperatures are represented in Fig. 5.5. Answer the following questions based on this figure.

(i) In which state will CO_2 exist between the points *a* and *b* at temperature T_1?

(ii) At what point will CO_2 start liquefying when temperature is T_1?

(iii) At what point will CO_2 be completely liquefied when temperature is T_2.

(iv) Will condensation take place when the temperature is T_3.

(v) What portion of the isotherm at T_1 represent liquid and gaseous CO_2 at equilibrium?

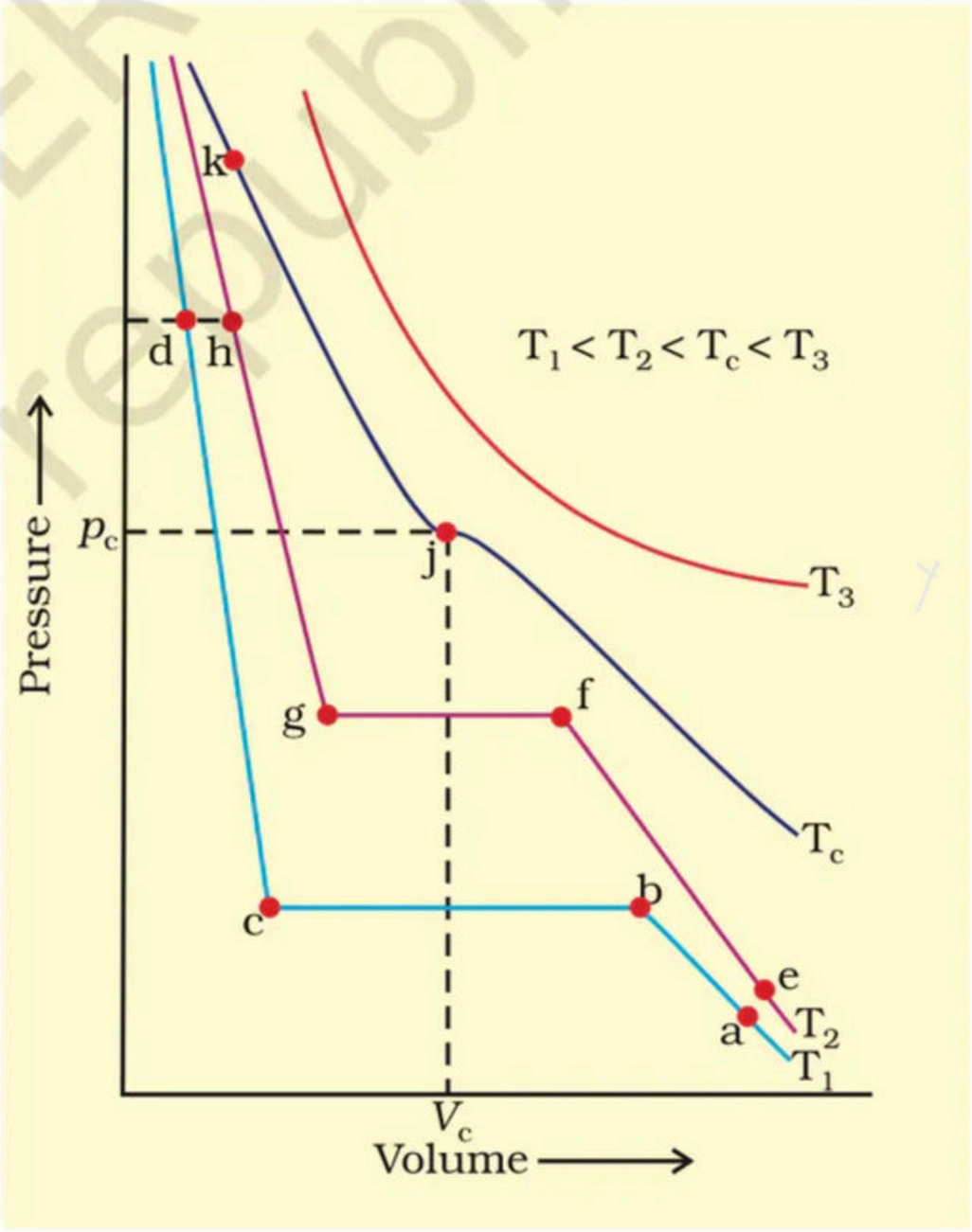


Fig. *5.5*

rigid

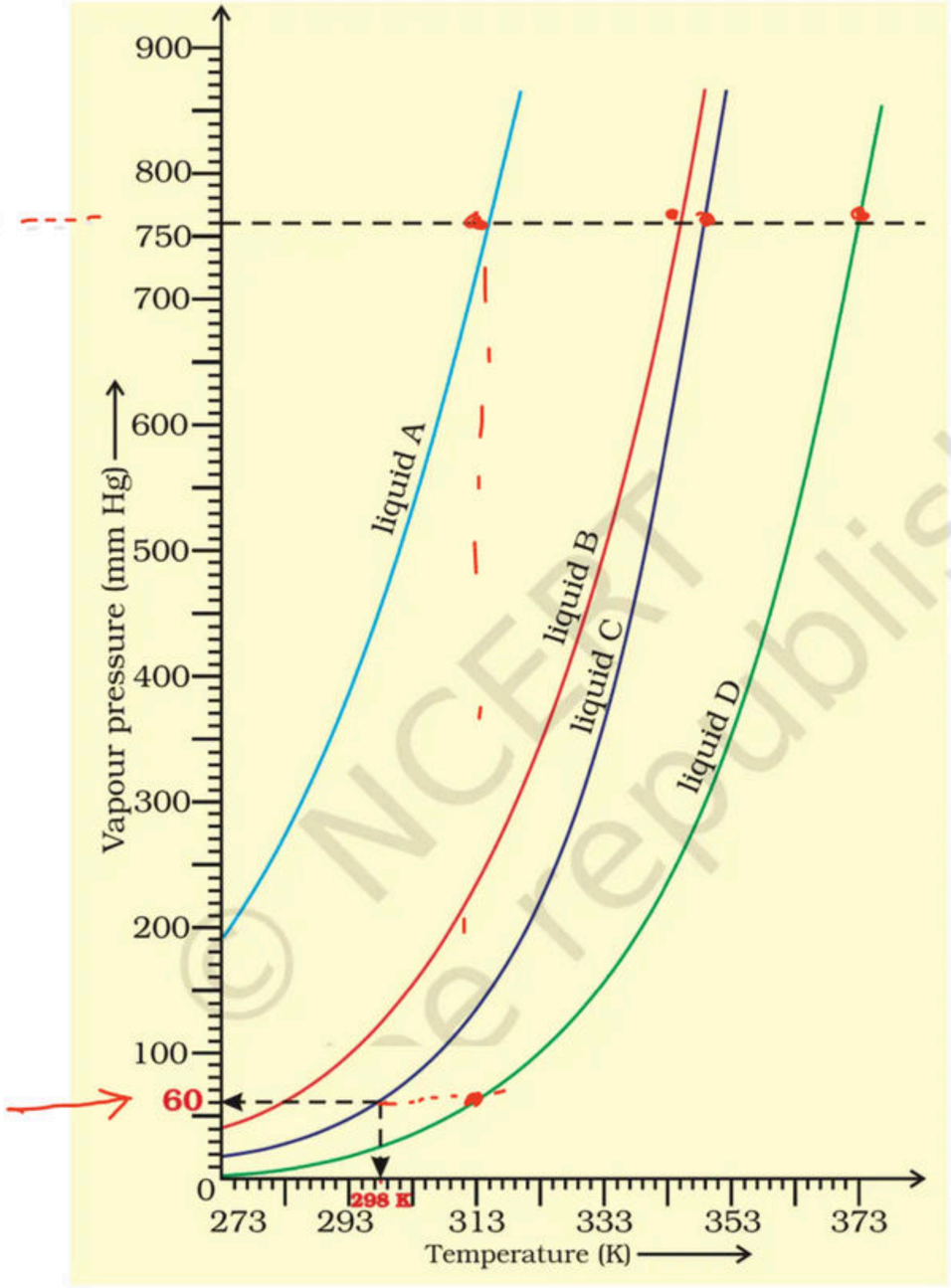


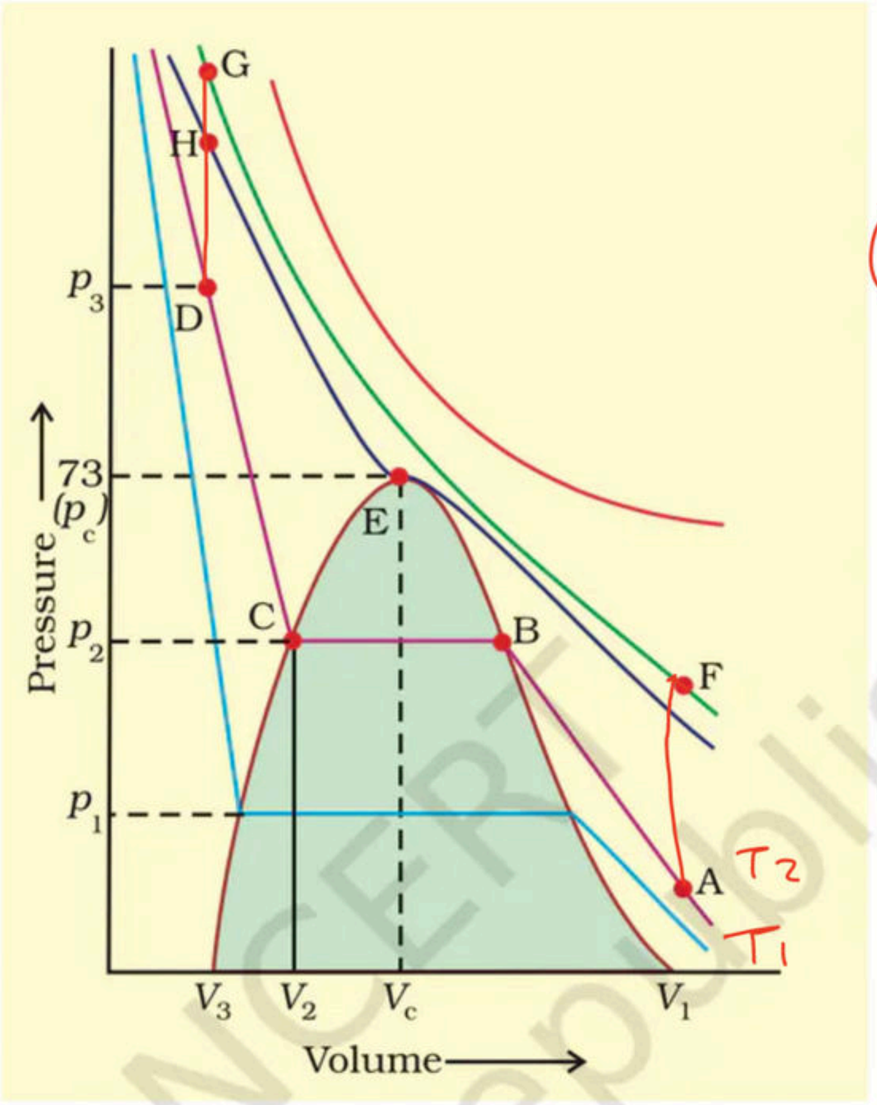
***Fig.** 5.6*

B.pt

Vap. pr

= external pr.

55. Isotherms of carbon dioxide gas are shown in Fig. 5.7. Mark a path for changing gas into liquid such that only one phase (i.e., either a gas or a liquid) exists at any time during the change. Explain how the temperature, volume and pressure should be changed to carry out the change.



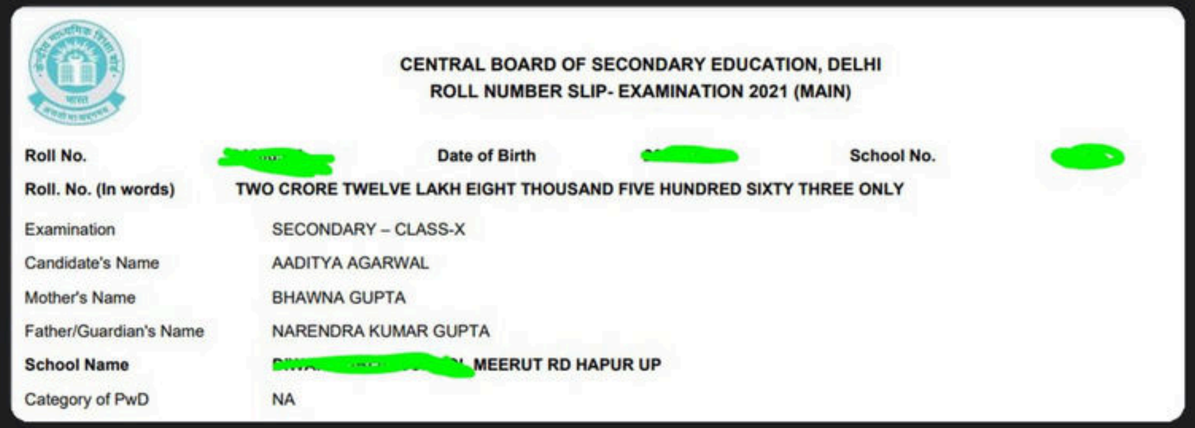
AEGHD

Fig. 5.7

Question

from Aaditya Ag...

Sir plzz 1 baar ye dikha dijiye kuch log dropper bolte rehta h unhe ye dikh jayega ki 2021 m hi board result aaya tha



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