→ 16 weeks

mid — 50 → 8

min-1 — 25 → 4

min-2 — 25 → 12

End — 100 → 14

$\overline{200}$

25

S.M

C.S

M.B Statistic

A B

| A | B | | B | A | | AB | | | | AB |

Most Probable microo state

Q.S

$$\frac{n!}{n_1!\, n_2!\, n_3! \cdots n_v!}$$

Bosons

(ni - Photony)

B.E.S

| A | A | | AA | | | | AA |

zero(or) integral spin 0, 1, 2

Fermions

F.D.S

↓

BES + PEP

| A | A |

$e^{\ominus}$ p n

$\frac{MB}{C}$

B.E	F.D.S
1. indistinguishable	1. —
2. 0, 1, 2	2. $\pm\frac{1}{2}$
3. Photon	3. e^{-}, p

MB →

0.5

M-B Statistics

1. distinguishable & there is no symmetric restriction

2. There is no restriction on the no of particles in any eigen state

3. The total no of particles in the either system is always constant $n = n_1 + n_2 + n_3 \cdots\cdots + n_r = \sum_{i=0}^{i=r} n_i = \text{const}$

4. the sum of energies of all the particles in different quantum groups taken together constitutes the total energy of the system

300

large system

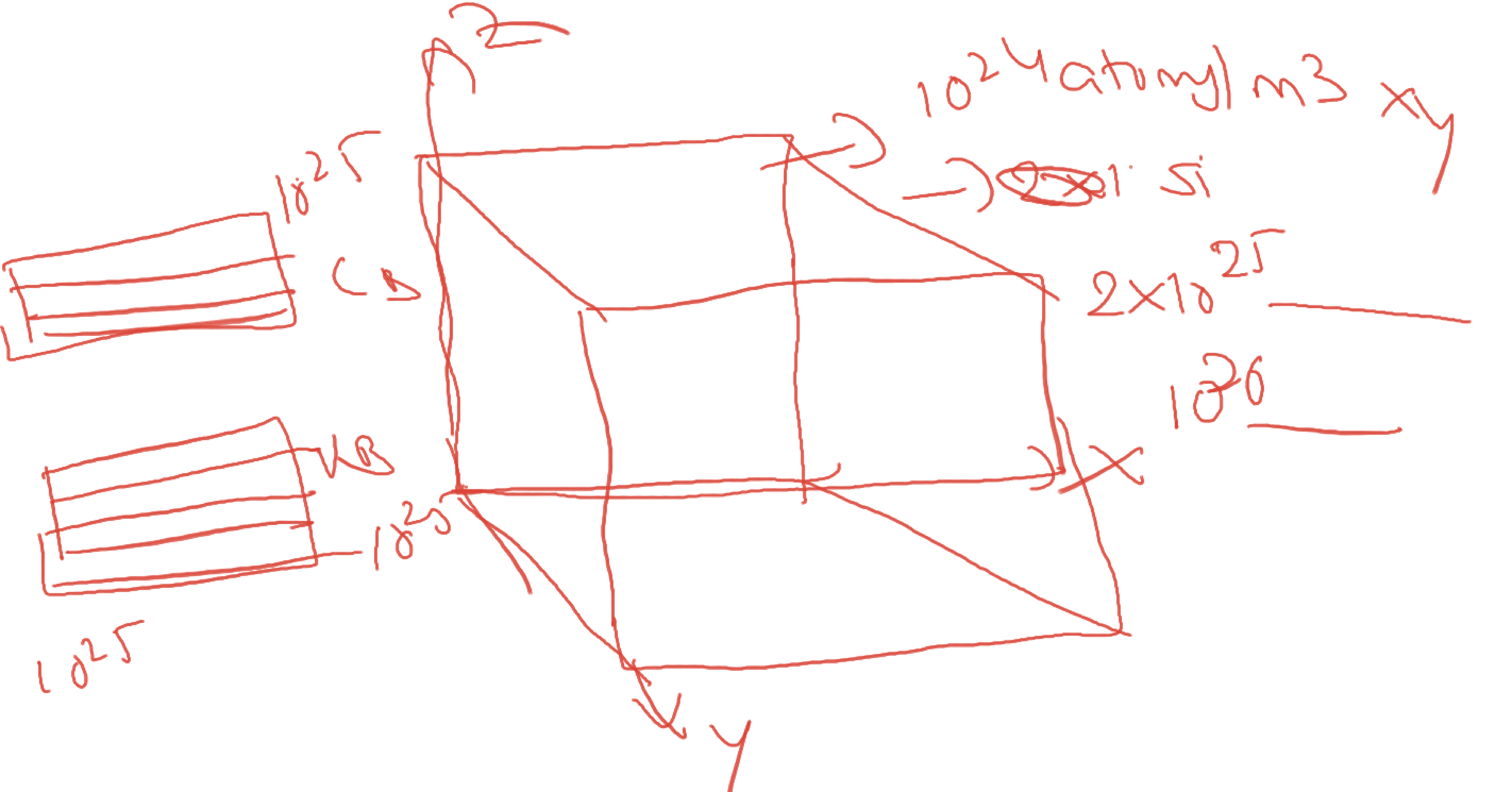
10^{24} atoms/m3

N,

$\Rightarrow 90^{90} =$

Total capacity = 90

Total no. of stu = 90


z
10^24 atom/m3 xy
Si
2x10^25
10^26
10^25
10^25
10^25
10^25
x
y

$$\sum_{i=0}^{i=\nu} \varepsilon_i n_i = \text{cnst}$$ $E_1, E_2, E_3, E_4 \ldots\ldots$ $E_i \rightarrow$ Energy level

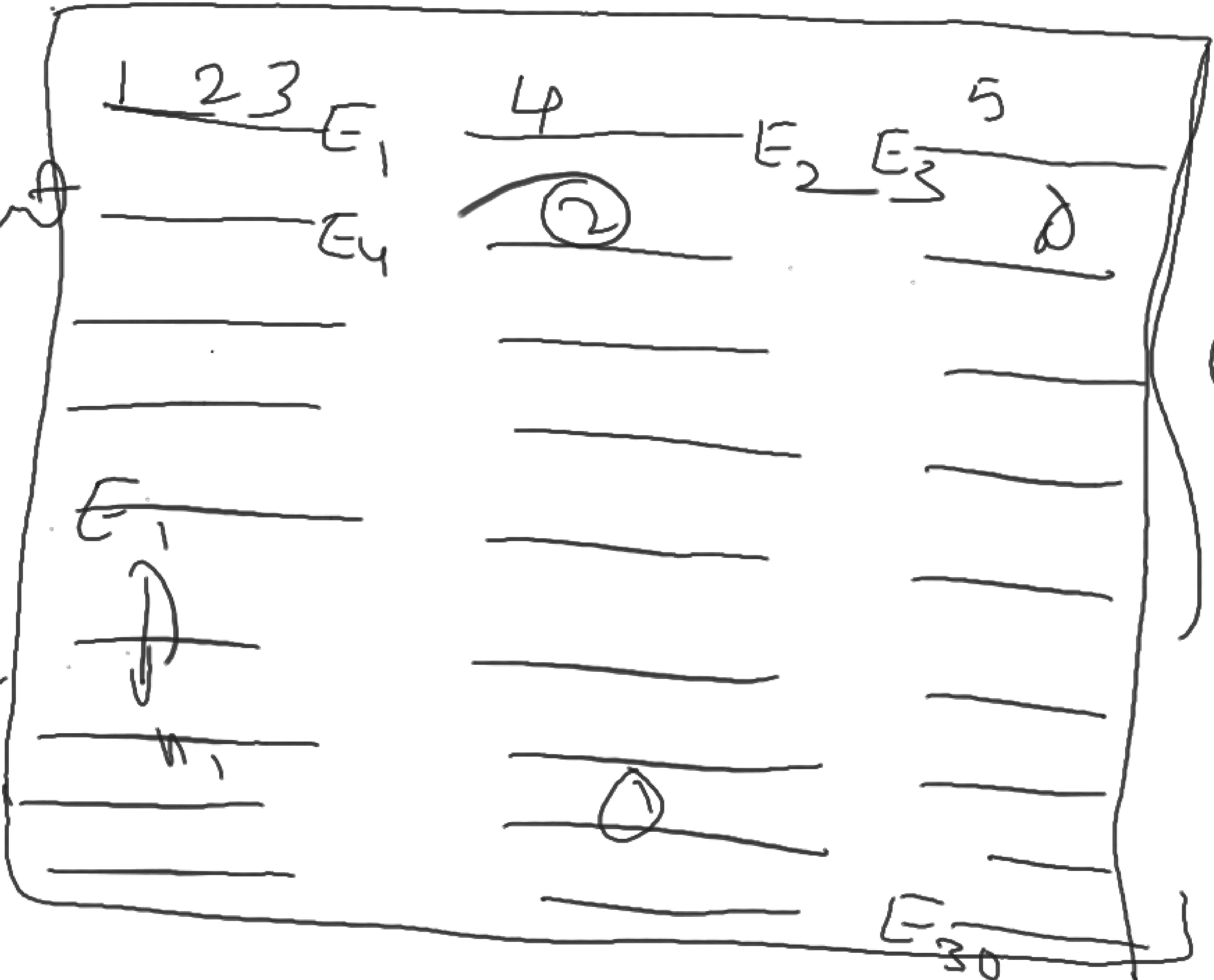
$n_1, n_2, n_3, n_4 \ldots\ldots$ $n_i \rightarrow$ Particly

$$\sum_{i=0}^{i=\nu} n_i = \text{cnst}$$

$n_1, n_2, n_3 \ldots\ldots n_i$ Particly lie in groups having approximat energiy $E_1, E_2, E_3, \ldots\ldots E_i \ldots\ldots$

$\sum_{i=0}^{i=r} n_i = const$ $\quad n_1, n_2, n_3 \ldots n_r \ldots r =$

$\sum_{i=0}^{i=r} \varepsilon_i n_i = const$



$\varepsilon_1, \varepsilon_2, \varepsilon_3$

n_1, n_2, n_3

30 desks

↳ 3 seater

90 students

30

$n_1 \to 3$

$n_2 \to 3$

$n_3 \to$

$n_{30} \to$

N E = V

available

$E_0, E_1, E_2, E_3, E_4 \cdots\cdots E_r$ E L in the system

$\updownarrow \quad \updownarrow \quad \updownarrow \quad \updownarrow \quad \updownarrow \qquad \updownarrow$

$n_0, n_1, n_2, n_3, n_4 \cdots\cdots n_r \cdots\cdots N$

3 2 4-2 5 3+2 . . . 1 = 90

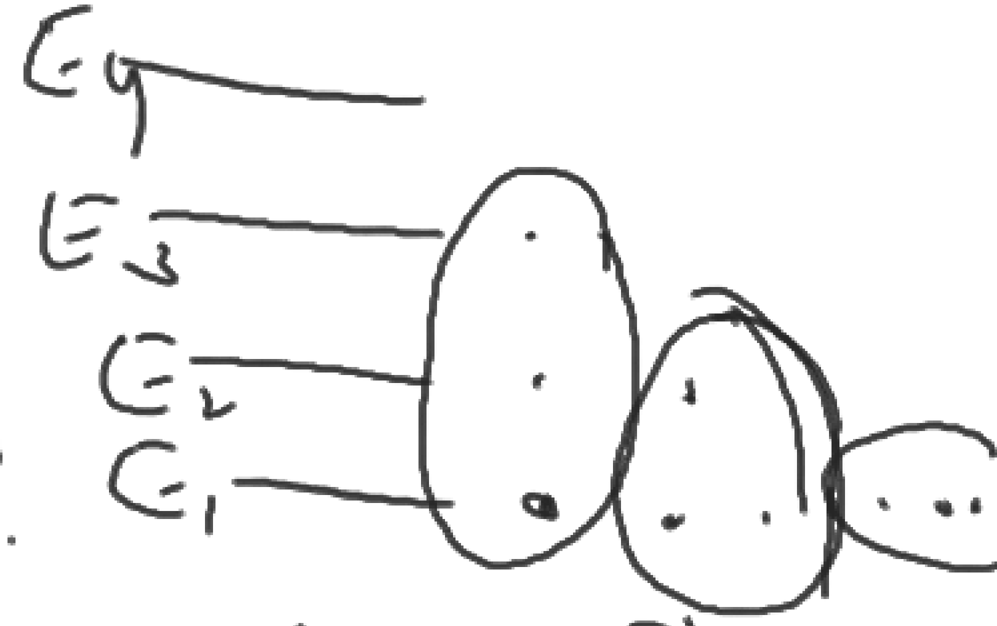
2 3 2 5 5

1 2 3
4 5 6
7 8 9
10

10

most probable micro

Most Probable micro state $= \Omega$



$$\Omega = \frac{n!}{n_0!\, n_1!\, n_2!\, n_3! \cdots n_r!}$$

$$\Omega = \frac{n!}{\prod_{i=0}^{i=r} n_i!}$$

take log on both sidy

$$\frac{3!}{1!\,1!\,1!} \quad \frac{3!}{2!\,1!} \quad \frac{3!}{3!}$$

6 : 3 : 1

60% 30% 10

$$\ln\Omega = \ln n! - \sum_{i=0}^{i=r} \ln n_i! \quad \text{— (1)}$$

$\text{const } n = 90$

$n_i \; n_0$

n_1

n_2

n_3

According to stirling approximation

$$\ln x! = x \ln x - x \quad \text{— (2)}$$

apply eqn (2) to (1)

$$\ln\Omega = \underline{n \ln n - n} - \sum_{i=0}^{i=r} \left[n_i \ln n_i - \underline{n_i} \right]$$

$$\delta \ln\Omega = \overset{\text{If}}{0} - \sum_{i=0}^{r} \left[\delta n_i \ln n_i + \cancel{n_i} \frac{1}{\cancel{n_i}} \cancel{\delta n_i} - \cancel{\delta n_i} \right]$$

For most probable distribution

$$\boxed{\sum_{i=0}^{i=r} [\delta n_i \ln n_i] = 0} \quad -(2)$$

Total no of particles in the system remains const

$$\boxed{\sum_{i=0}^{i=r} n_i = n = \text{const} \Rightarrow \sum_{i=0}^{i=r} \delta n_i = 0} \quad -3$$

E is const

$$\sum_{i=0}^{i=v} \epsilon_i n_i = E = \text{const}$$

$$\boxed{\sum_{i=0}^{i=v} \varepsilon_i \delta n_i = 0 \quad - \quad 4}$$

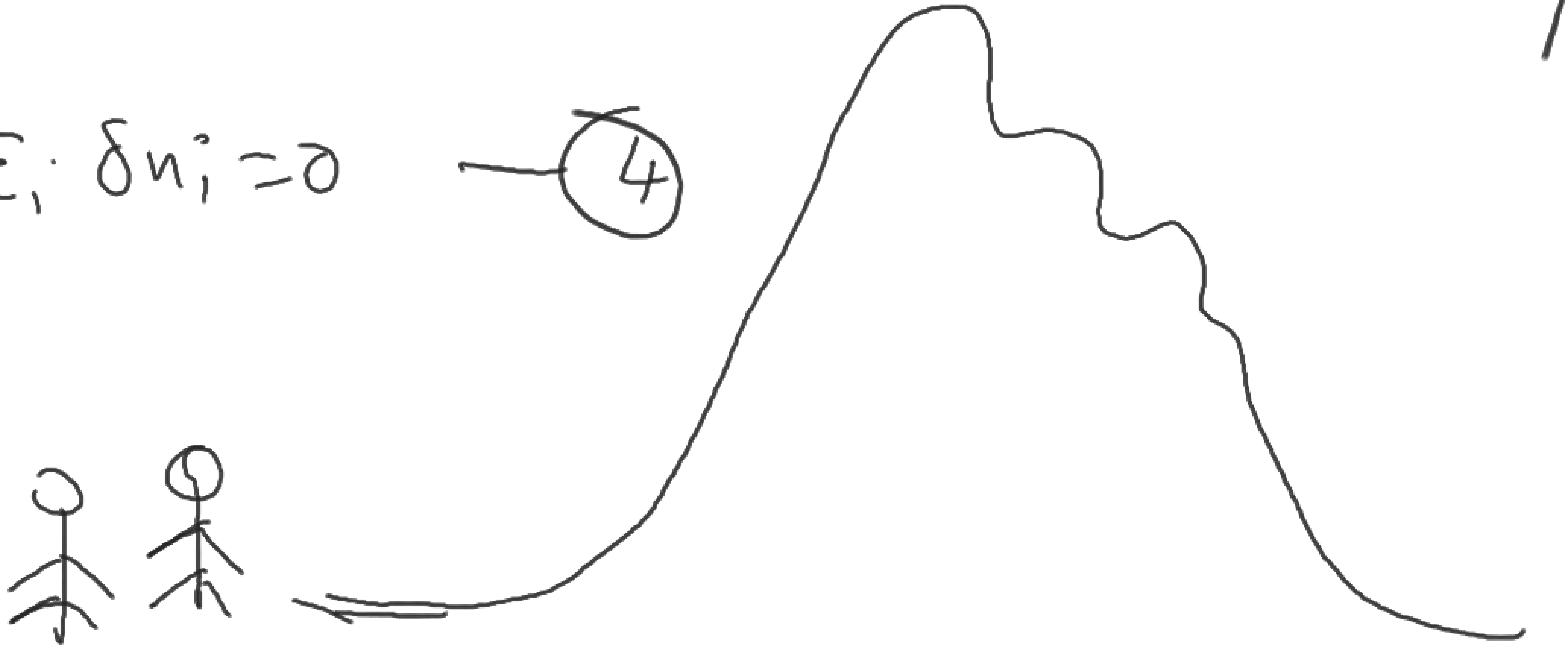
$$\sum_{i=0}^{i=r}\left[\delta n_i \ln n_i\right] = 0 \quad — \quad (2)$$

$\varepsilon_1 \quad \varepsilon_2 \quad \varepsilon_3 \quad \varepsilon_{\cdot}$

$n_1 \quad n_2 \quad n_3 \quad n_{\cdot}$

$$\sum_{i=0}^{i=r} \delta n_i = 0 \quad — \quad (3)$$

$$\sum_{i=0}^{i=r} \varepsilon_i \, \delta n_i = 0 \quad — \quad (4)$$



lagrange method of undeteminent multipliers

$$\sum_{i=0}^{\nu} \delta n_i \ln n_i = 0 \qquad (2) \times 1$$

$$\sum_{i=0}^{\nu} \delta n_i = 0 \qquad -(3) \times \alpha$$

$$\sum_{i=0}^{\nu} \varepsilon_i \delta n_i = 0 \qquad -(4) \times \beta$$

$$\sum_{i=0}^{\nu} \left[\delta n_i \ln n_i + \delta n_i \times \alpha + \varepsilon_i \delta n_i \times \beta \right] = 0$$

$$\sum_{i=0}^{\nu} \left[\ln n_i + \alpha + \varepsilon_i \beta \right] \delta n_i = 0$$

$$\ln n_i + \alpha + \beta \epsilon_i = 0$$

$$\ln n_i = -\left[\alpha + \beta \epsilon_i\right]$$

$$n_i = e^{-\alpha} e^{-\beta \epsilon_i}$$

$$\sum_{i=0}^{r} n_i = n \Rightarrow \sum_{i=0}^{r} e^{-\alpha} e^{-\beta \epsilon_i} = n$$

$$e^{-\alpha} \sum_{i=0}^{r} e^{-\beta \epsilon_i} = n$$

$T \uparrow \; i = j$

$$e^{-\alpha} = \frac{n}{\sum_{i=0}^{v} e^{-\beta \epsilon_i}} = \frac{n}{P}$$

$$n_j = \frac{n}{P} e^{-\frac{\epsilon_j}{KT}}$$

P is the Partition function

$$\beta = \frac{1}{KT}$$

$$\boxed{n_i = \frac{n}{P} e^{-\frac{\epsilon_i}{KT}}}$$

$$P = \sum_{i=0}^{v} e^{-\beta \epsilon_i}$$

$$\boxed{n_i = \frac{n}{P} e^{-\beta \epsilon_i}}$$

$i = 0$

$$n_0 = \frac{n}{P} e^{-\beta \epsilon_0}$$

$i = 1$

$$n_1 = \frac{n}{P} e^{-\beta \epsilon_1}$$

$i = 2$

$$n_2 = \frac{n}{P} e^{-\beta \epsilon_2}$$