A) given data :-

The volume 'V' each are filled with ideal gas under normal conditions

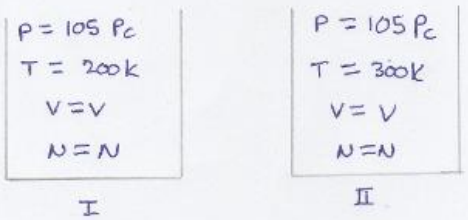
The room temperature (T) = 300K

Atmospheric pressure P = 105Pa

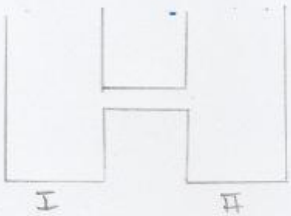
the occupational asymmetry of $\Delta N/N = 10^{-9}$ is exp(100) times less than the probability of equal occupation

The two containers, $\Delta N = 0$

let the identical containers are as follows




The connected to each other



$$\frac{\Delta N}{N} = 10^{-9}$$

$$\frac{\Delta N}{N} + \{(exp)(100)\} = 0$$

$$\Delta N = \{exp\,(100)\}(-N)$$

$\therefore$ Initially $V_I = V_{II} = V$

when $N$ is different $V$ also changes

$\therefore \Delta N = N\,10^{-9}$

letters assume $N'$ atoms are present in fist container then $(N-N') + N$ atoms are in container 2

Now total change in atoms .

$$2N - N' = \Delta N$$

$$2N - N\,(10^{-9}) = N'$$

$$N' = (2 \times 10^{-9})\,N$$

$$V_3 = \left(\frac{RT}{P}\right)(2 - 10^{-9})\,N$$

$$V_{II} = (10^{-9})\,N\left(\frac{RT}{P}\right)$$