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THERMODYNAMICS

(1)

(2) 40 %   2 kcal

$W = 0.8\ \text{kcal}$

(6)

$= n C_v \ln \frac{T_2}{T_1} + 0$

$= 2 \times 3/2 \ln \frac{573}{473}$

(7)   S–I

$\frac{T_2 - T_1}{T_2} = \frac{380 - 280}{380}$

$\frac{Q_2 + Q_1}{Q_2}$

THERMODYNAMICS

③ $\frac{1}{6} = \frac{T_2 - T_1}{T_2}$

$1/3 = \frac{T_2 - (T_1 - 65)}{T_2}$

⑤ Isothermal irrev

⑥ Rev adia

⑦

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Q. $P^2 V = C$

$P V^{1/2} = \text{const}$

$\begin{pmatrix} 1 \text{ lit} \\ 300\text{K} \end{pmatrix} \longrightarrow \begin{pmatrix} 4 \text{ lit} \\ \cancel{T = ?} \end{pmatrix}$

600K

$$\Delta S_{sys} = nC_v \ln \frac{T_2}{T_1} + nR \ln \frac{V_2}{V_1}$$

$$\frac{nRT}{V} V^{1/2} = C$$

$$\frac{T}{V^{1/2}} = \text{const}$$

$$\frac{T_2}{T_1} = \left(\frac{V_2}{V_1}\right)^{1/2} = \left(\frac{4}{1}\right)^{1/2} = 2$$

$$T_2 = 2T_1 = 600\text{K}$$

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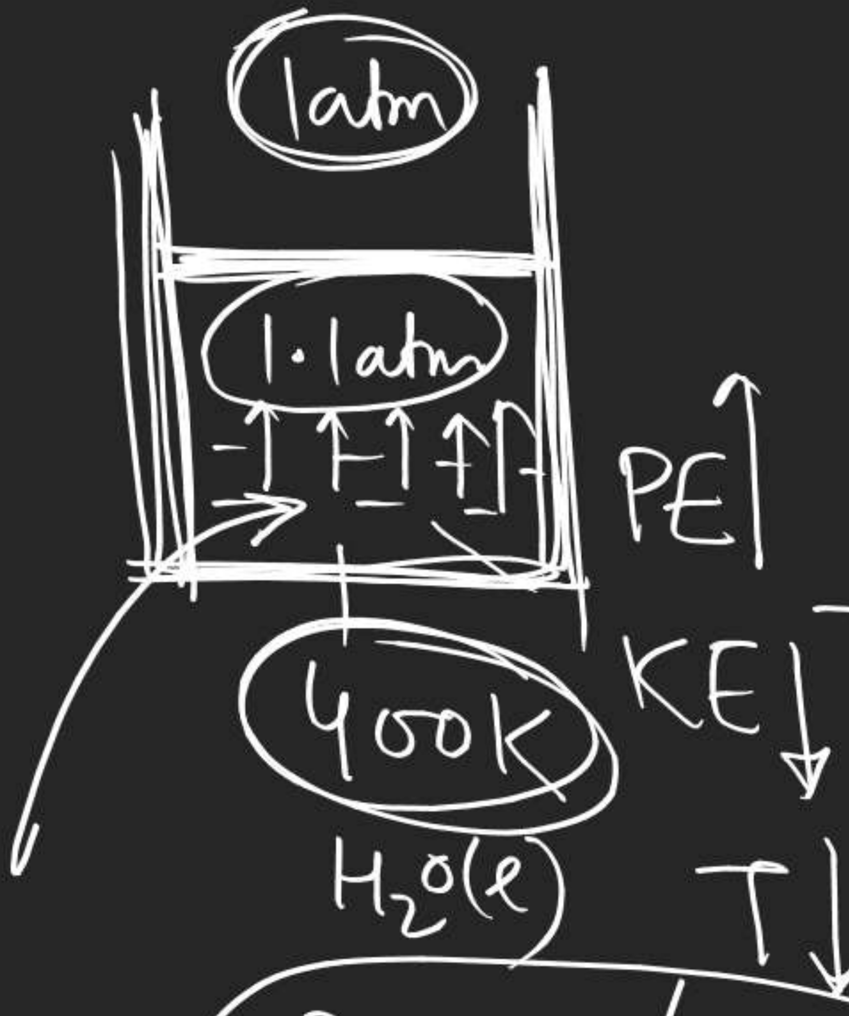
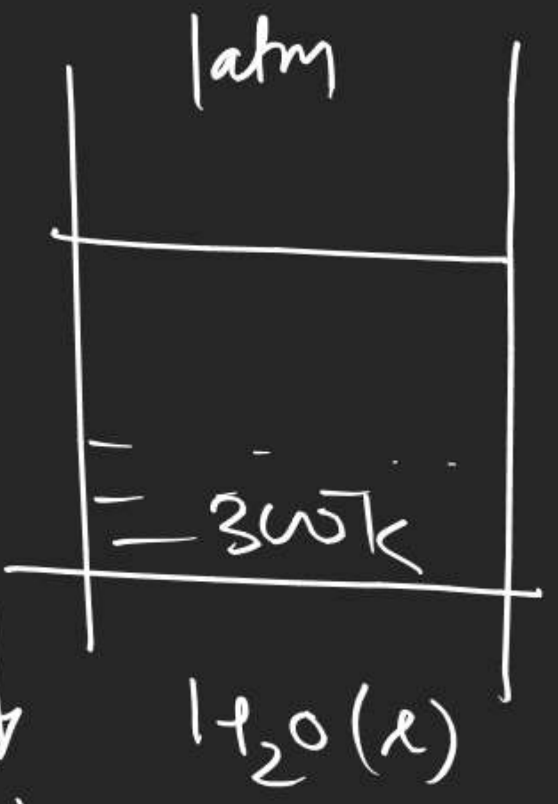
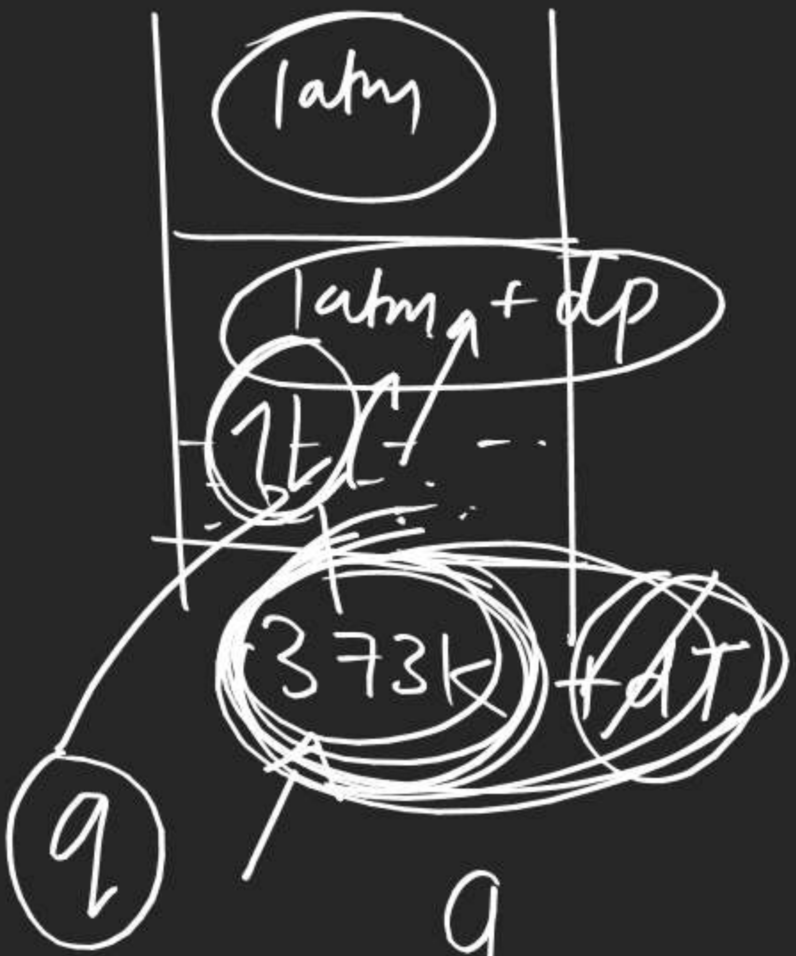
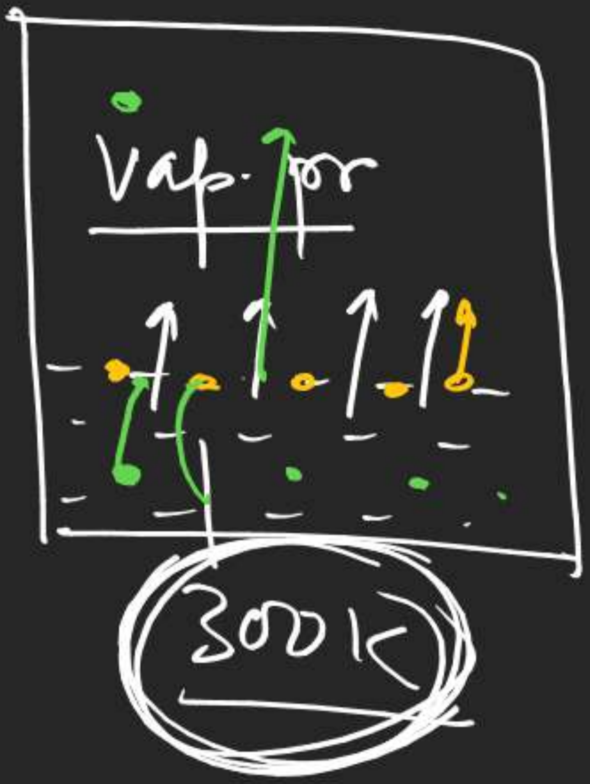
THERMODYNAMICS





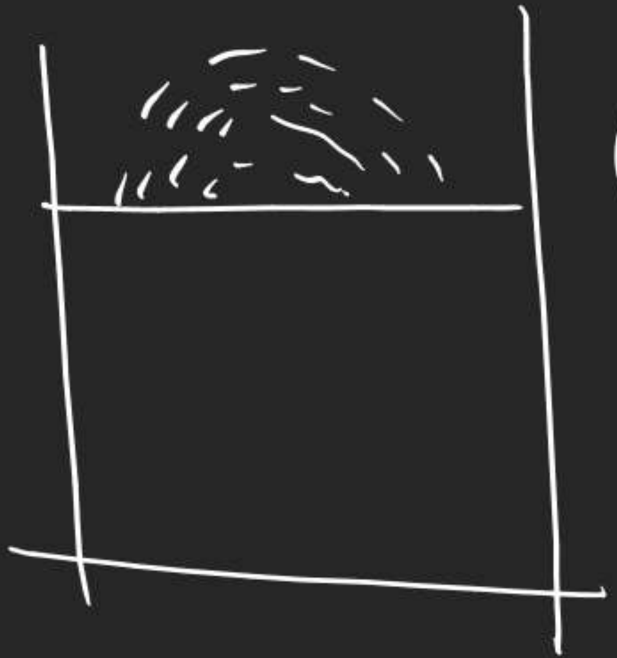




$$\frac{Q_{irr}}{400} \neq \Delta S$$

$$dS = \frac{q_{rev}}{T}$$

$$\Delta S = \frac{Q_{rev}}{T} = \boxed{\frac{\Delta H}{T} = \Delta S}$$



Rev

$$\boxed{\frac{\Delta H}{T} = \Delta S}$$

for phase change carried out m.pt & b.pt.

⇒ phase change carried out at m.pt & b.pt are reversible in nature.

$$\Delta H = n C_p \Delta T$$

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$$A + B \longrightarrow C + D$$

$T = 300\,K \qquad P = 1\,atm$

$Q_{sys_{irr}} = -100\ kJ$

$$\Delta S \neq \frac{-100 \times 10^3}{300}$$

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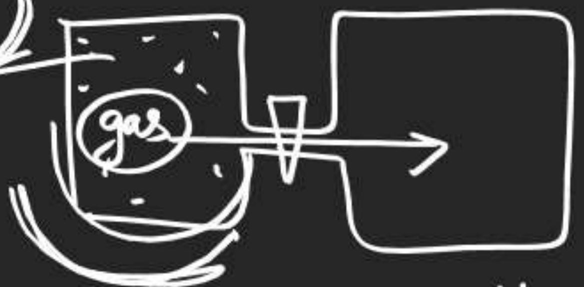
Physical significance of entropy

disorder ↑



disorder
randomness
uncertainity

which occurs on its own

$\Delta S_{sys} = 0 + nR\ln\frac{V_f}{V_i} > 0$

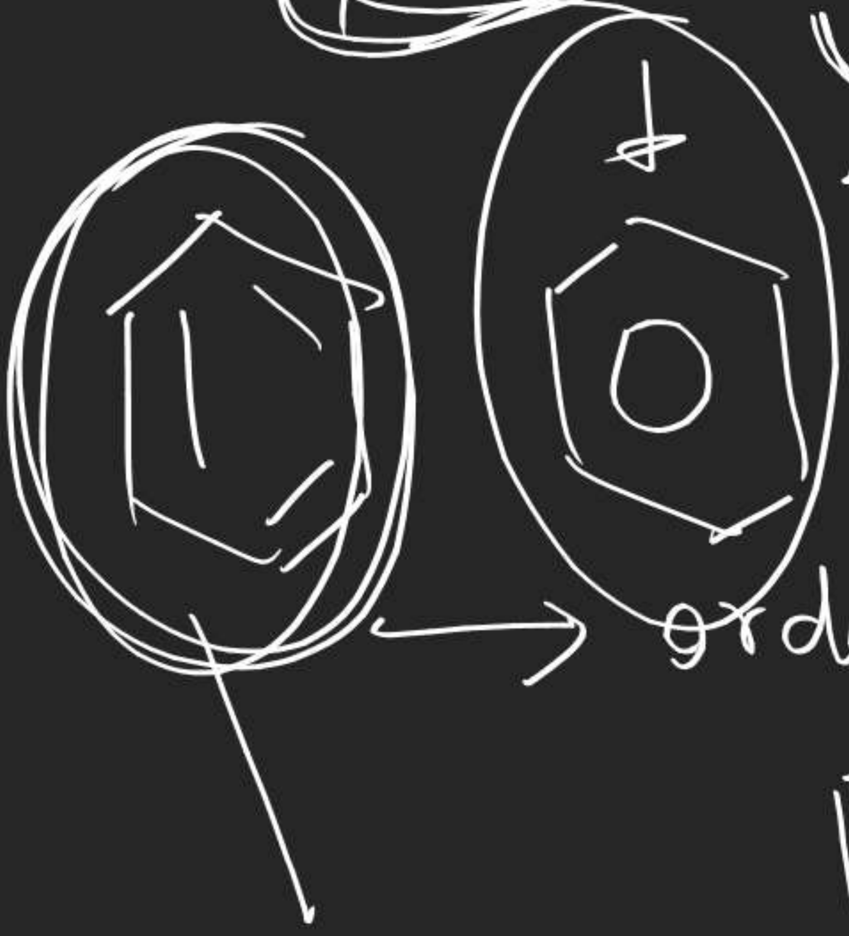
$\Delta S_{surr} = 0$

$\Delta S_{univ} > 0$

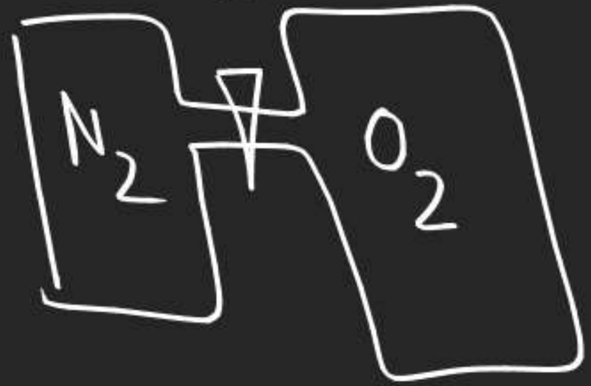
$S_{univ} \uparrow$

feasible
Spontaneous
irreversible

more the no. of options more will be uncertainity



order gives way to disorder spontaneously



Entropy is the measure of "disorder"

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Prediction of sign of ΔS_{sys} using the concept of randomness :→

① With 'T' at const 'V'

$$\Delta S_{sys} = nC_V \ln\frac{T_2}{T_1} + \cancel{nR\ln\frac{V_2}{V_1}} \rightarrow 0$$

T ↑ S ↑ disorder ↑

② With volume at const 'T'

$$\Delta S = 0 + nR\ln\frac{V_2}{V}$$

As V ↑ S ↑ disorder ↑

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③ During phase change

$s \longrightarrow l \longrightarrow g$

$\Delta H > 0$

$\Delta S_{sys} = \frac{\Delta H}{T} > 0$

$s < l \ll g$

$\Delta S_{vap} > \Delta S_{fusion}$