

Review of THERMODYNAMICS

Entropy is a property calculated mainly
to know the feasibility of the process

$$\Delta S_{\text{univ}} > 0 \quad \text{FEASIBLE PROCESS}$$

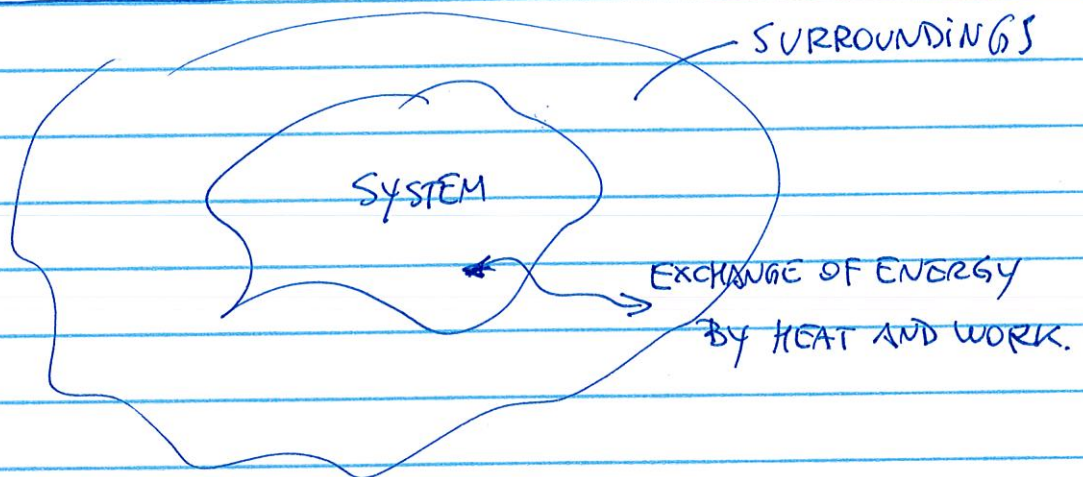
\uparrow universe.

$$\Delta S_{\text{univ}} < 0 \quad \text{UNFEASIBLE PROCESS.}$$

$$\Delta S_{\text{univ}} = 0 \quad \text{EQUILIBRIUM IS REACHED.}$$

IDEAL SITUATION

CONCEPT OF UNIVERSE



$$\text{UNIVERSE} \equiv \text{SYSTEM} + \text{SURROUNDINGS.}$$

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$$\Delta S_{\text{univ}} > 0$$

$$\Delta S_{\text{sys}} + \Delta S_{\text{surrounding}} > 0 \quad \text{FEASIBLE PROCESS}$$

it could be negative

it has to be positive and of larger magnitude.

WHAT IS THE PROBLEM WITH THIS APPROACH?

WE NEED TO CALCULATE ΔS_{syst} and $\Delta S_{\text{surround.}}$

Gibbs \equiv FREE ENERGY (or Gibbs Energy)

$$G = H - TS$$

ABSOLUTE TEMPERATURE.

ENTROPY.

ENTHALPY

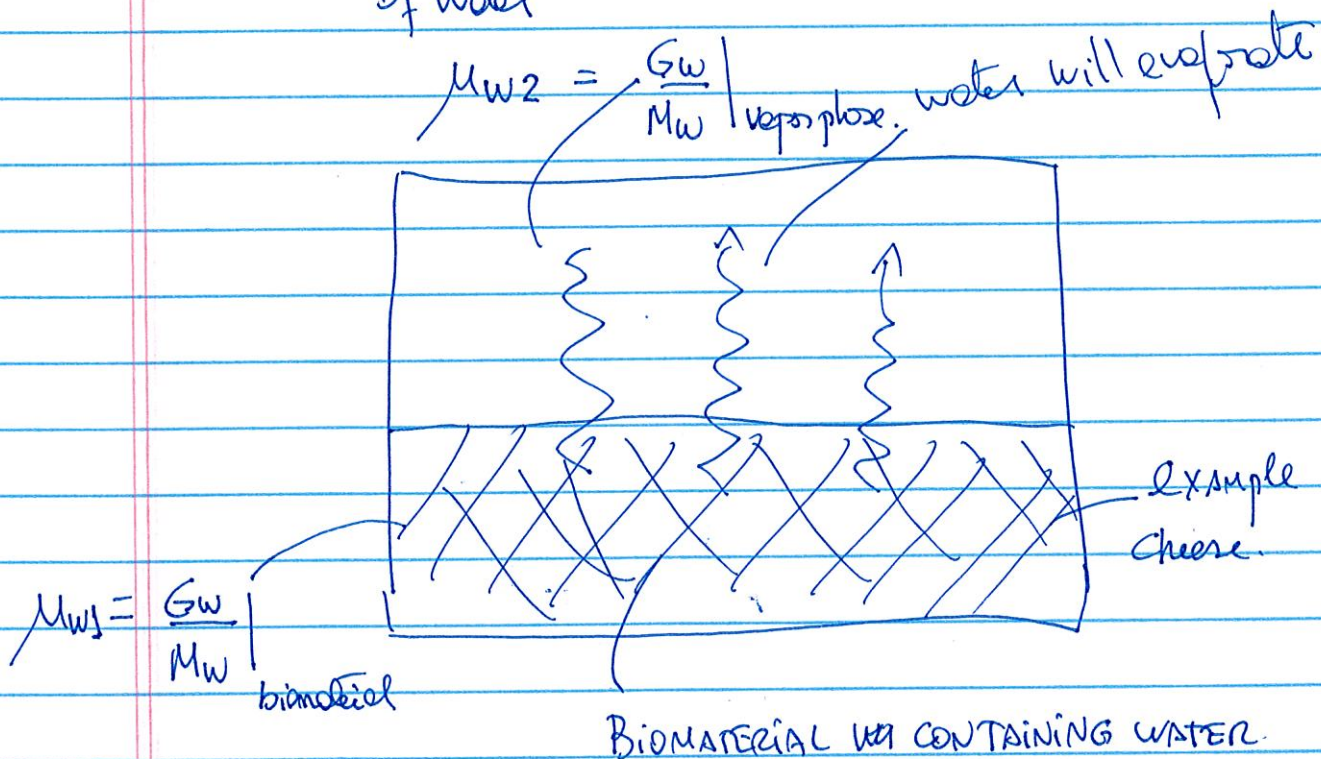
IF WE EXPRESS THE FEASIBILITY CONDITIONS IN TERMS OF G

$\Delta G_{\text{sys}} > 0$	UNFEASIBLE
$\Delta G_{\text{sys}} < 0$	FEASIBLE.
$\Delta G_{\text{sys}} = 0$	EQUILIBRIUM.

G_w FREE ENERGY OF WATER KJ (3) \uparrow water.

$$\frac{G_w \left[\frac{\text{KJ}}{\text{mol of water}} \right]}{M_w} = \mu_w$$

\uparrow Molecular weight of water
 \uparrow CHEMICAL POTENTIAL.



TO HAVE EVAPORATION OF WATER FROM THE BIOMATERIAL TO THE AIR SPACE $\mu_{w1} > \mu_{w2}$

It will stop when an equilibrium is achieved

$$\mu_{w1} = \mu_{w2}$$

CALCULATION OF CHEMICAL POTENTIAL

(4)

FOR A GAS [REAL GAS]

$$\mu_w = \mu_w^\circ + RT \ln \frac{f_w}{f_w^\circ}$$

↖ fugacity of water

$\frac{f_w^\circ}{f_w}$ ← fugacity of pure water.

FOR AN IDEAL GAS

$$\mu_w = \mu_w^\circ + RT \ln \frac{P_w}{P_w^\circ}$$

↖ Free Enpy per mol of pure water at

Pressure. Temp T

P_w° ← vaps pressure of pure water.

