

Thermodynamics

HEAT → Movement Action. (Kinetic)

1st Law - Heat is work and J or KJ

$R = 0.08206 \frac{L \cdot atm}{Mole \cdot K}$

$R = 8.314 \frac{J}{Mole \cdot K} \stackrel{OR}{=} 8.314 \times 10^{-3} \frac{KJ}{Mole \cdot K}$

Mar 22-7:39 AM

2nd Law Heat travels Spontaneously
from **HOT** → **COLD**

3rd Law → Anything in its elemental (normal) form has an energy of formation = 0

ΔH_f°

Mar 22-8:04 AM

Entropy

ΔS (Joules)

Randomness / Disorder

Spontaneous rxn $\oplus \Delta S$

UNiverse (var room) gets "Messier" Spont.

Enthalpy

ΔH (Kilo Joules)

Heat / Work / ENERGY

Energy decreases $\ominus \Delta H$ Spontaneously

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Table C

Mar 22-8:08 AM

Enthalpy

time (sec)

System → cools down

Touch → HOT - releases heat to surroundings

Enthalpy

time (sec)

System - gains heat

Surroundings feel - feels cold. Takes my heat away.

g → l
 $\oplus \Delta S$

$\ominus \Delta H$

Non-Spont. $\Delta H \oplus$

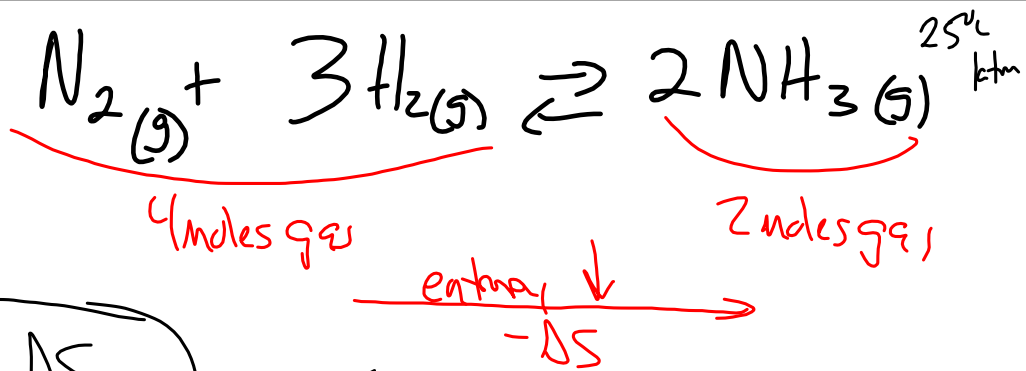
$\oplus \Delta S$ Spont
l → g

Mar 22-8:17 AM

Entropy

- ① Translational Motion → Moving
Changes Location
- ② Rotational Motion - Stays in same
area → spins around.
- ③ Vibrational → one spot → shakes.

Mar 22-8:22 AM



Find ΔS_{rxn}

$$\Delta S_{rxn} = n \sum \Delta S_{prod} - n \sum \Delta S_{react.}$$

$$\Delta S_{rxn} = [2(192.5)] - [1(191.5) + 3(130.58)]$$

$$\Delta S_{rxn} = -198.24 \text{ J}$$

Mar 22-8:36 AM

Spont $\ominus \Delta H$ and $\oplus \Delta S$ } Tendency
 NonSpont $\oplus \Delta H$ and $\ominus \Delta S$
 ???
 ... $\ominus \Delta H$ and $\ominus \Delta S$ OR $\oplus \Delta H$ and $\oplus \Delta S$.
Definite Spont or non-spont ΔG
 Gibbs free energy
 (SI)

Mar 22-9:04 AM

WATCH UNITS
 Convert

$\Delta G = \Delta H - T \Delta S$
 Temp in **KEVIN**

Mar 22-9:07 AM

$\Delta G = \Delta H - T\Delta S$

Spont

$\Delta G = (-) - (+ +)$

$= (-) - (+)$

$= (-) + (-)$

$\Delta G = (-)$

Mar 22-9:09 AM

$\ominus \Delta G = \boxed{\Delta H} - \boxed{T\Delta S}$

Spont \rightarrow Smaller # Larger #

Tie breaker

High T \rightarrow tend Spont.

$\Delta G \ominus$ Spont $\Delta G = 0$ $\Delta G \oplus$ Non-Spont

Spont \leftarrow $\Delta G = 0$ \rightarrow Non-Spont

Mar 22-9:11 AM

Spont \longrightarrow nonspont
occurs when

$$\Delta G = 0$$

EQUILIBRIUM

Mar 22-9:14 AM

19 / 41, 50, 58 atb

Mar 22-9:15 AM