(b) Intensive properties are non additive where as Extensive property are additive. Eg [T_1, m_1] + [T_2, m_2]

total mass: $m_1 + m_2$ additive. Ex additive

but $T_1 + T_2$ is not possible. Intensive not additive.

Enthalpy (H) → $H = E + PV$

Calculation of change in enthalpy: $\Delta H = \int n C_p \, dT \Rightarrow \Delta H = n C_p \int_{T_1}^{T_2} dT$ (if C_p is independent of T)

$\Rightarrow \Delta H = n C_p (T_2 - T_1) \Rightarrow \Delta H = n C_p \Delta T$; C_p = molar heat capacity

Relation between ΔH and ΔE

$H = U + PV$

State 1: $H_1 = U_1 + P_1 V_1$

State 2: $H_2 = U_2 + P_2 V_2$

$\Delta H = H_2 - H_1 \Rightarrow \Delta H = U_2 + P_2 V_2 - (U_1 + P_1 V_1)$

$\Rightarrow \Delta H = U_2 - U_1 + P_2 V_2 - P_1 V_1 \Rightarrow$ $\boxed{\Delta H = \Delta U + \Delta (PV)}$

Case A at constant volume: $\Delta H = \Delta U + V \Delta P$

Case B ,, ,, pressure: $\Delta H = \Delta U + P \Delta V$

Case C for gaseous Rxn

∵ Reactions are generally carried out at constant T & P.

for gases $PV = nRT$. $\Delta H = \Delta U + \Delta (PV)$ ∵ $PV = nRT$

$\Rightarrow \Delta H = \Delta U + \Delta (nRT) \Rightarrow$ $\boxed{\Delta H = \Delta U + \Delta n_g RT}$

Δn_g = total gaseous moles of product − total gaseous moles of reactant

Eg → $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$ $\Delta H = \Delta U + (-2 \times RT) \Rightarrow$ $\boxed{\Delta H = \Delta U - 2RT}$

Q find the Relⁿ betwⁿ ΔH and ΔU for the following Rxn →

(i) $C(s) + \frac{1}{2} O_2(g) \rightarrow CO(g)$ $\boxed{\Delta H = \Delta U + \frac{1}{2} RT}$

(ii)

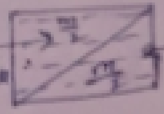
Heat exchange

- Heat exchange at constant P: $q_p = \Delta H$
- Heat exchange at V const: $q_v = \Delta U$

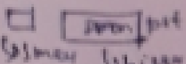
Isolated system :-) the system which canot exchange matter as well as energy from its surrounding (Ex universe nothing exchange

Macroscopic properties -> (i) Extensive (ii)

When a closed system is divided into two or more parts then the properties whose value changes are called Extensive properties and those which do not change are called Intensive properties



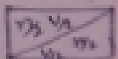
Extensive properties -) the measurable properties of a system which depends on (i) size of system and (ii) amount of matter present in the system Ex - Mass, Volume, no. of mole, Heat capacity (Heat content



heat given Enthalpy (H) Internal energy (U), Entropy (S) Gibbs free energy (G)

Intensive properties :-) The measurable properties of a system which do not depend on size of system and amount of matter present in the system. eg - Temp Concentration, molarity,

pressure $pv = nRT$



$p = \frac{n/2 \cdot RT}{V/2}$, $p = \frac{nRT}{V}$ same, p doesnot change

refractive index, Specific capacity, molar heat capacity, pH EMF of cell.
pH - depend on concn.

* some important characteristics of Extensive and Intensive properties

(1) A -) Extensive properties
B -) Extensive .. ratio $\frac{A}{B}$ or $\frac{dA}{dB}$ (differentiate) = Intensive

[illegible] the ratio of two Ex. properties is always an Intensive properties. eg Molarity - $n = Ex.$, $V = Ex.$ $\frac{n}{V}$ = concn. molarity - Intensive

density = $\frac{Mass}{Vol}$ Ex Ex. Intensive

(2) If an extensive property is represented as per unit mass or per unit mol. or per unit volume. It becomes an Intensive prop

Specific heat capacity = heat capacity per unit mass.

molar heat capacity = heat capacity per unit mol.

Enthalpy = Exten. Molar enthalpy = Intensive molar entropy = Inten

Entropy = " Molar Gibbs free energy = Intensive

Gibbs free en "