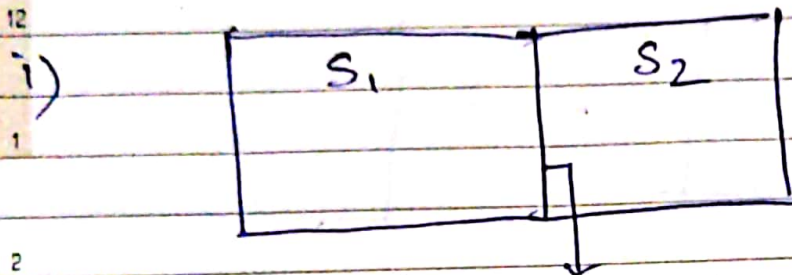
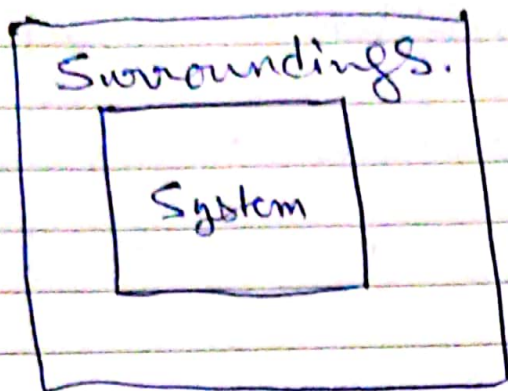


27

December • Monday

WK 53 (361-004)

Thermodynamics: Macroscopic property without microscopic details.



diathermic wall.

System, surroundings, boundary

Open, closed, isolated

Thermodynamic Variable $\rightarrow P, V, T, n, m$

Homogeneous / Heterogeneous.

Eggt: Thermodynamics is valid

One eq^t to another eq state.

Extensive.

$\propto N$

$\odot \odot V, m$

Intensive

T

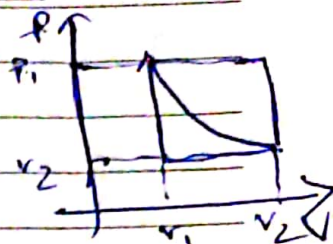
Extensive \rightarrow intensive
 $\frac{1}{N}$

State variable: describe eq state

Thermodynamics Process:

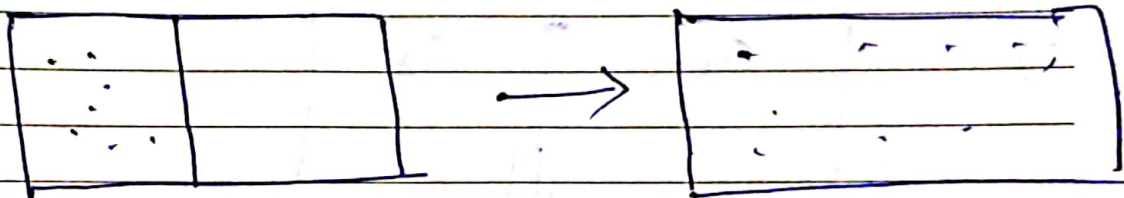
Reversible: Isolated system

initial \rightarrow final state.



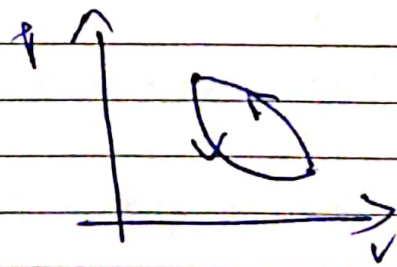
If we can't restore the initial state.
irreversible process.

All natural process are irreversible.



Quasi static process: When a process is carried out extremely slowly such that at each step the system is in thermal & thermodynamic equilibrium.

Cyclic process \rightarrow



Isochoric \rightarrow volume const

Isoobaric \rightarrow pressure const

Isothermal \rightarrow Temp remain const.

Adiabatic \rightarrow no exchange of thermal energy with the surroundings.

25

December • Saturday

WK 52 (359-006)

Hot Cold

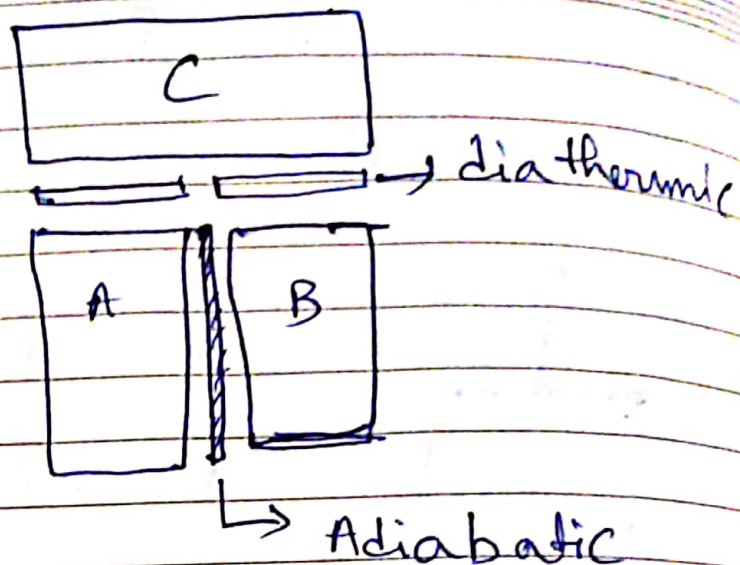
December - 2021

M	T	W	T	F	S	S	M	T	W	T	F	S	S
			1	2	3	4	5	6	7	8	9	10	11
13	14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31									

Zeroth Law:

2 Temp:

Def of temp & measurement of temp



Temp is a property of the system that dictate wheather the system is in thermal equilibrium with each other.

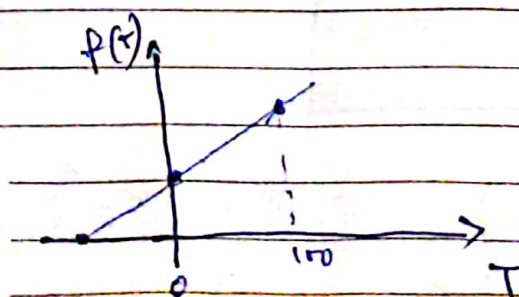
Resistivity / volume. of property of one substance

Centigrade / ~~Fahren~~ Pahrenheit

0 → 100 melting point & Boiling point 32 → 212

Ideal Gas Thermometer :-

$PV = f(T) = \text{const}$ independent of the gas.



$$PV = nRT$$

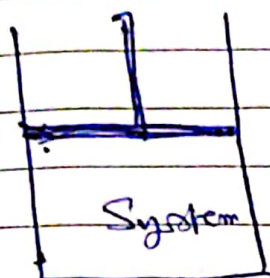
Eq of state.

2021

Work:

$$W = \vec{F} \cdot \vec{dx}$$

work due to expansion/compression of gas



$$F = P \cdot A$$

$$W = \int F \cdot dx = P \cdot A \cdot dx = P dV$$

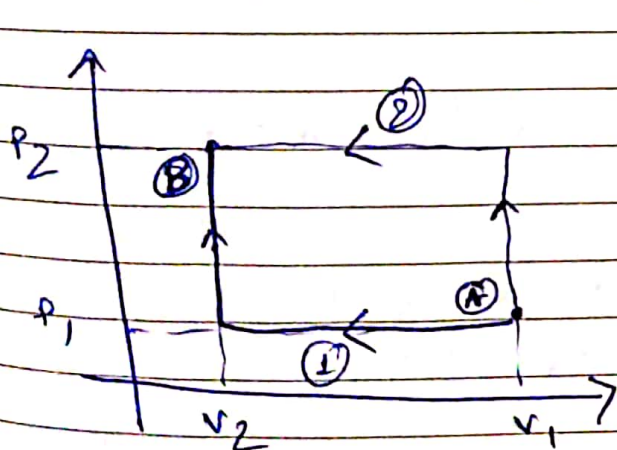
Convention:

Work done on the system.

⇒ compression. $dw = -P dV$

$\Delta V < 0 \Rightarrow dw > 0$

Work done by the system $dV > 0, dw < 0$



$$dw_2 = - \int_{v_1}^{v_2} P_1 dV = -P_1 (v_2 - v_1) = P_1 (v_1 - v_2)$$

$$dw_1 = - \int_{v_1}^{v_2} P_2 dV = P_2 (v_1 - v_2)$$

$$P_2 > P_1 \Rightarrow \boxed{W_2 > W_1}$$

Reversible:

$$W_T = P_1 (v_1 - v_2) - P_2 (v_1 - v_2)$$

Closed cycle:

$$= (P_1 - P_2) (v_1 - v_2) < 0$$

23

WK 52 (357-008)

December • Thursday

M T W T F S S							December 2021						
		1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31									

$$\Rightarrow W_T = \oint dw \neq 0.$$

Work is not a state func.

Heat: A form of energy

$$T \xrightarrow{Q \uparrow} T_2 \quad T_2 > T_1$$

$$W = - \int P dv = \int_1^2 dw.$$

$W > 0$. Work done on the system.

Heat \Rightarrow Path dependent.

$$Q > 0 \Rightarrow$$

2021

First Law of Thermodynamics: Internal energy

$$\oint (dw + dq) = 0$$

Any closed path.

$$dU = dq + dw$$

path independent



path \downarrow dependent cancels.

$$dU_s = dq + dw$$

$$dU_{\text{surroundings}} = -dq - dw$$

$$\Delta U_{\text{universe}} = 0$$