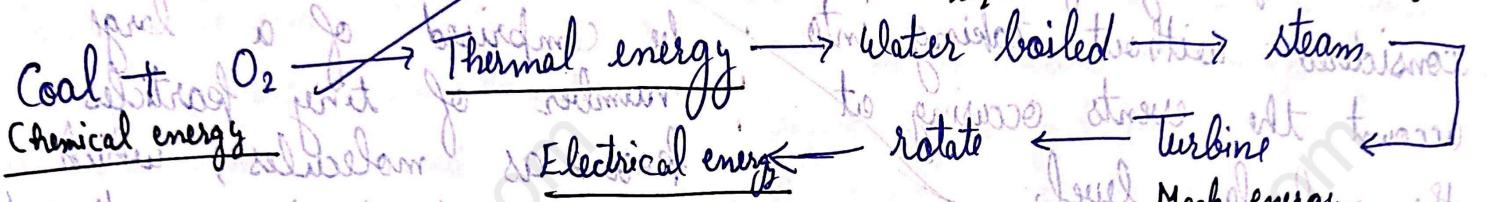


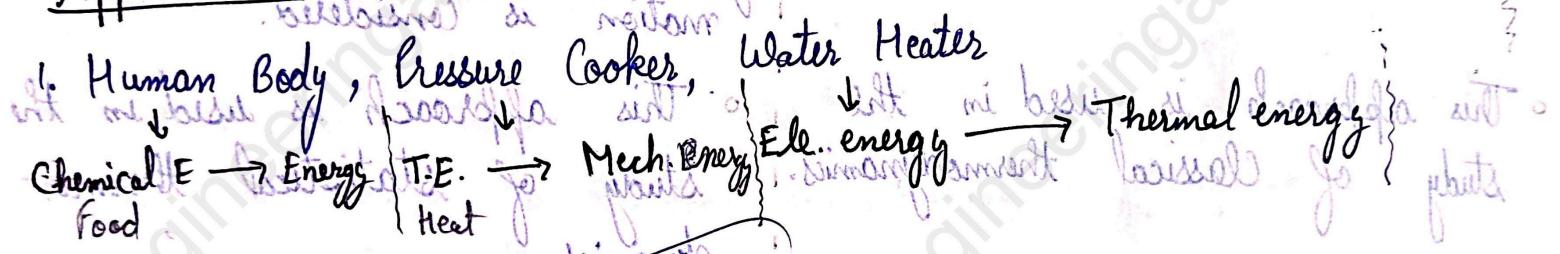
What is Thermodynamics?

- It is a science of energy transfer and its effect on the physical properties of substance.
- It describes how thermal energy is converted to other form of energy or vice versa.

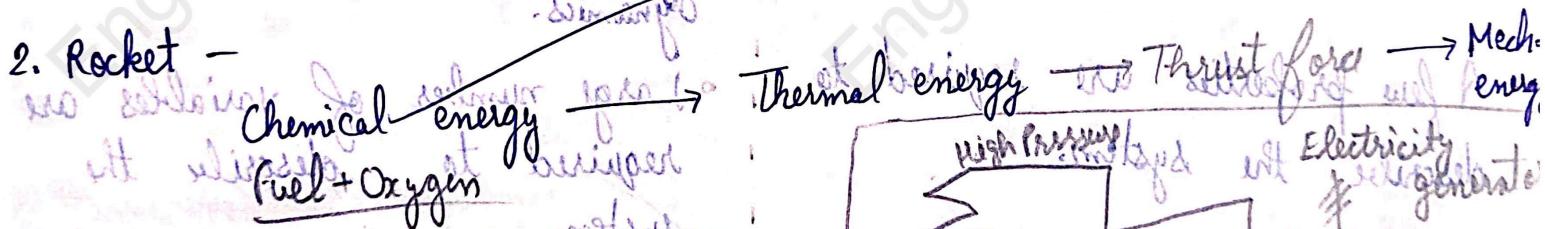
For example Steam Power Plant:



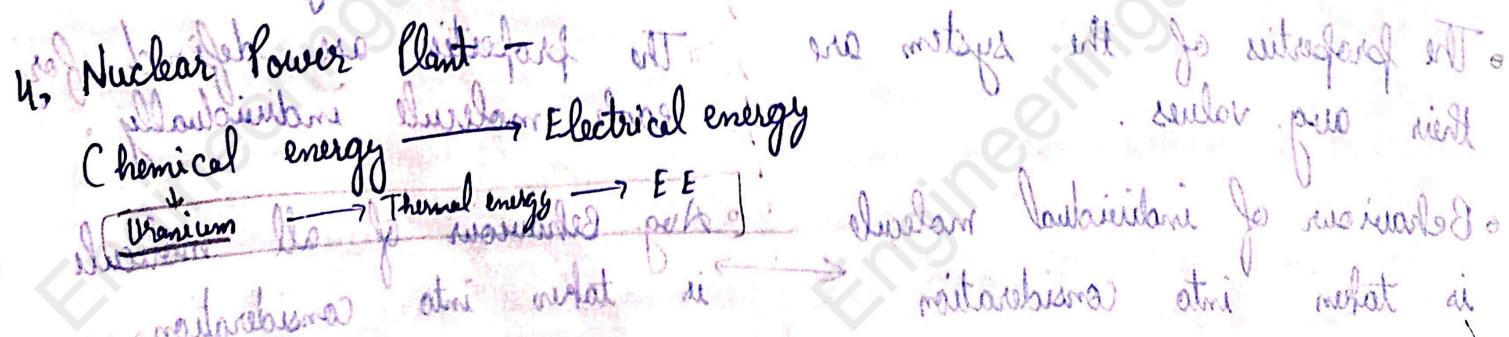
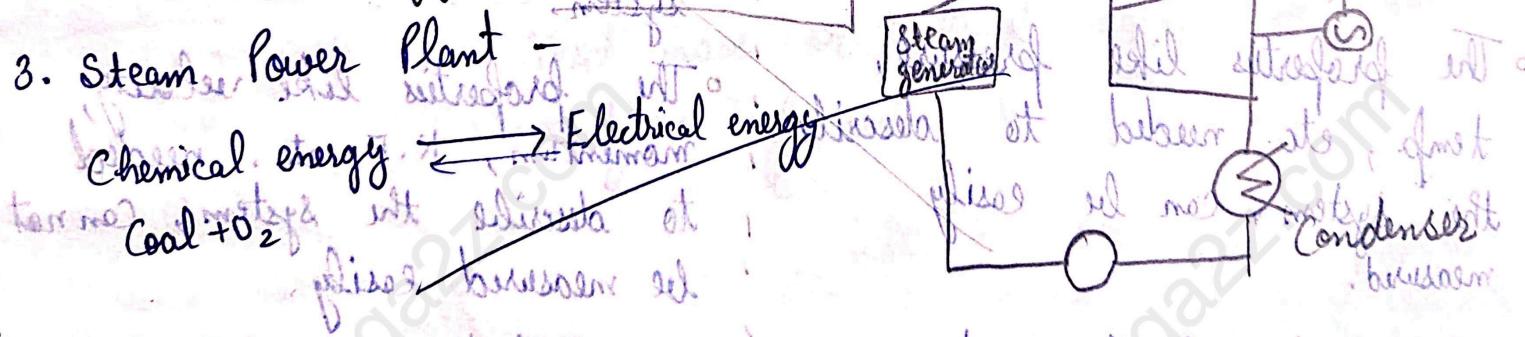
Application:



2. Rocket -



3. Steam Power Plant -



5. Domestic Refrigerator — Based on 2nd law of Thermodynamics

6. Room Air Conditioner —

7. Internal Combustion engines

Macroscopic & Microscopic

Macroscopic:

- a certain quantity of matter is considered without taking into account the events occurring at the molecular level.
- This approach is used in the study of Classical thermodynamics.
- A few properties are required to describe the system.
- The properties like pressure, temp., etc. needed to describe the system, can be easily measured.
- The properties of the system are their avg. values.
- Behaviour of individual molecule is taken into consideration

Microscopic:

- The matter is comprised of a large number of tiny particles known as molecules, which move randomly in a disorderly fashion. The effect of molecular motion is considered.
- This approach is used in the study of statistical thermodynamics.
- Large number of variables are required to describe the system.
- The properties like velocity, momentum, K.E. etc. needed to describe the system, can not be measured easily.
- The properties are defined for each molecule individually.
- Avg. Behaviour of all molecule is taken into consideration.

- Simple mathematics formulas are required.
- Approximate result
- Less time consuming
- No assumptions are to be considered regarding nature of matter.
- Applied when density is high.
- In this, atomic str. of substance to be continuous so concept of continuum is valid.
- Complex mathematics and statistical methods are required.
- Accurate and exact result
- More time consuming
- Assumption of molecular theory is considered to allow concept of continuum is not valid.
- Applied when density is low.
- In this, atomic str. of substance is discontinuous so concept of continuum is not valid.
- It is used in space explorations.

Concept of Continuum:

- Intermolecular distance is negligible
- Mean free path is smaller than given dimension of system
- Disorder is not considered

Q. When a (Volume) limited system is considered.

THERMODYNAMIC SYSTEM

It is defined as the fixed mass or fixed region in space upon which our study is focused.

mass = Const.

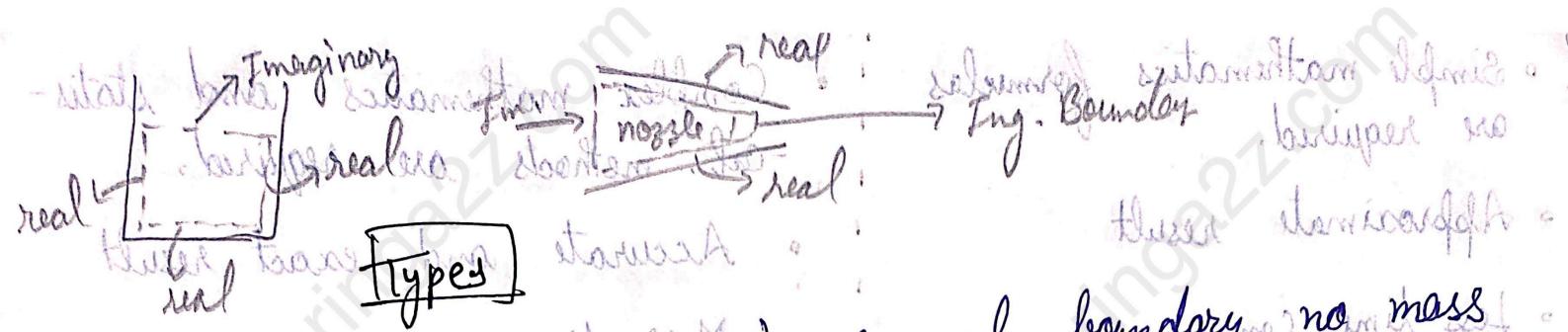
Volume = Const.

System is a system or region that contains energy or matter that is separated from its surroundings by walls or boundaries.

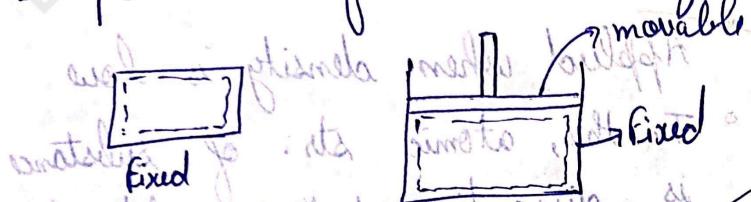
SURROUNDINGS: Everything external to the system.

BOUNDARY: It is a real or imaginary surface which separates system from the surroundings.

Mathematically speak a boundary has zero thickness, no mass and no volume.

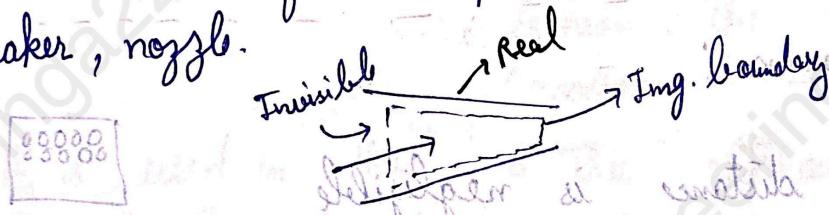


Real Boundary (fixed or movable): In real boundary no mass transfer is possible. Examples: Walls of classroom, cylinder piston with no valve, bulb.



Imaginary Boundary (invisible): In imaginary boundary mass transfer is possible.

Ex. - Open beaker, nozzle.



Classification of Boundary:

On the basis of movement

1). Rigid (fixed)

- Dimension of boundary is fixed, neither will be changed.
- Ex. - Boundary of room

2). Flexible (movable)

- Dimension of boundary is changed.
- Ex. - Boundary of balloon will be flexible.

On the basis of heat transfer

Diathermic Wall

- Boundary which allow heat to flow through it.
- Ex - Metal Container

Adiabatic Wall

- Boundary which do not allow heat to flow through it.
- Ex - Thermo flask

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