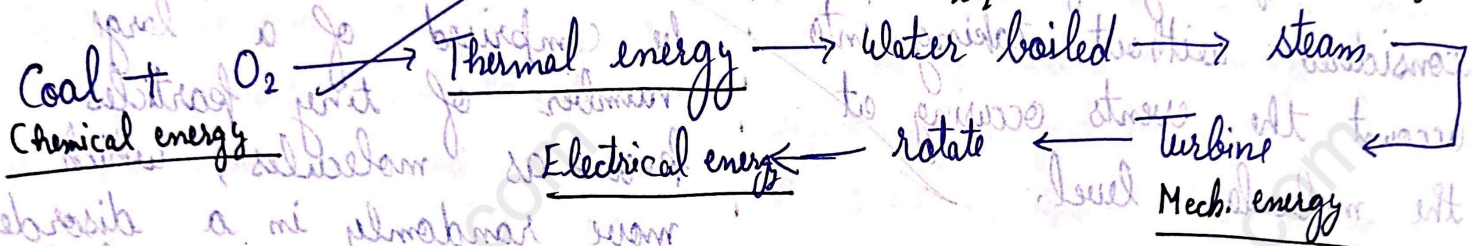


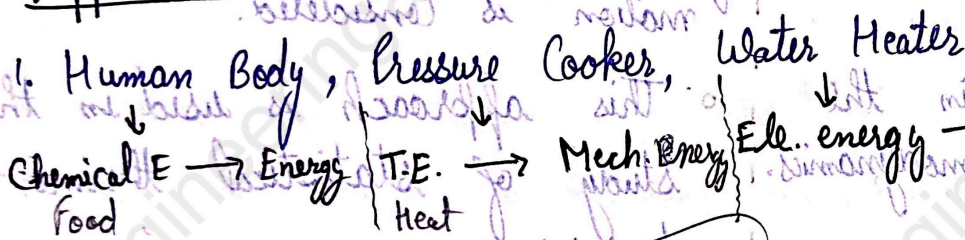
What is Thermodynamics?

- 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.

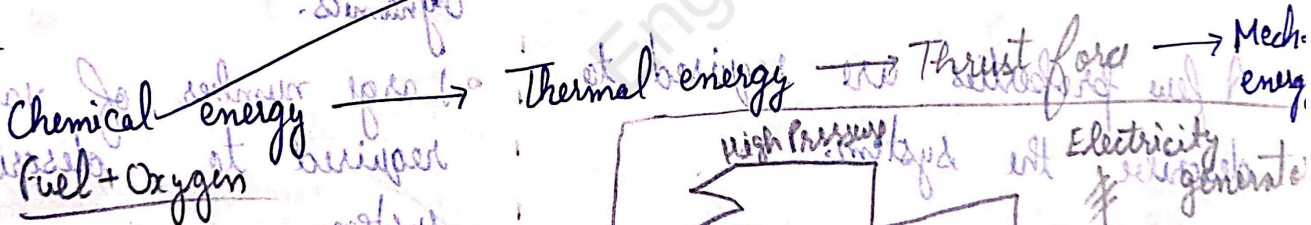
For example - Steam Power Plant



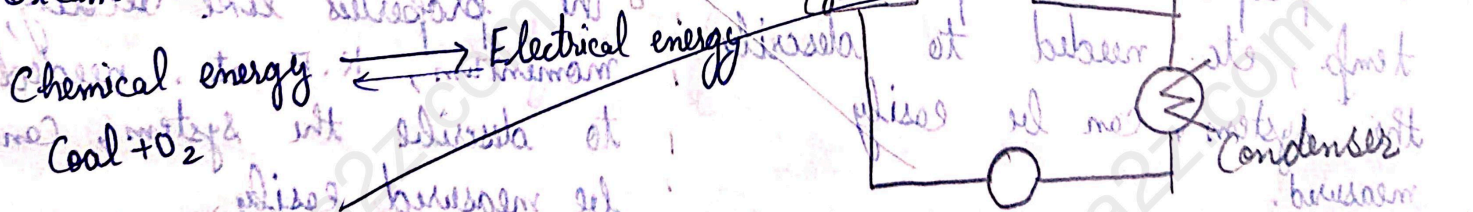
Application



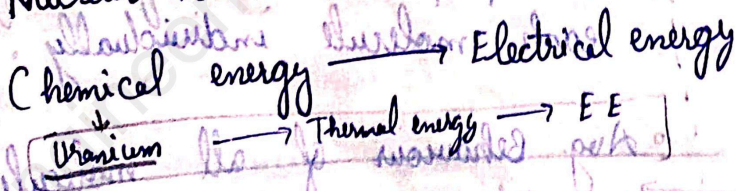
2. Rocket -



3. Steam Power Plant -



4. Nuclear 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 considered to be comprised of a large number of tiny particles known as molecules, which move randomly in a disordered 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, cannot 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 assumption 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.
- Applied when density is low.
- In this, atomic str. of substance is discontinuous so concept of Continuum is not valid.
- It used in space exploration.

* Concept of Continuum:

- Intermolecular distance is negligible
- Mean free path is smaller than given dimension of system $\leftarrow \circ \circ \rightarrow$
- Disorder नहीं होता रहता

Q. क्या है?

* THERMODYNAMIC SYSTEM:

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

mass = const.

Volume = const.

System is

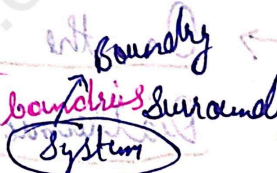
SURROUNDING :

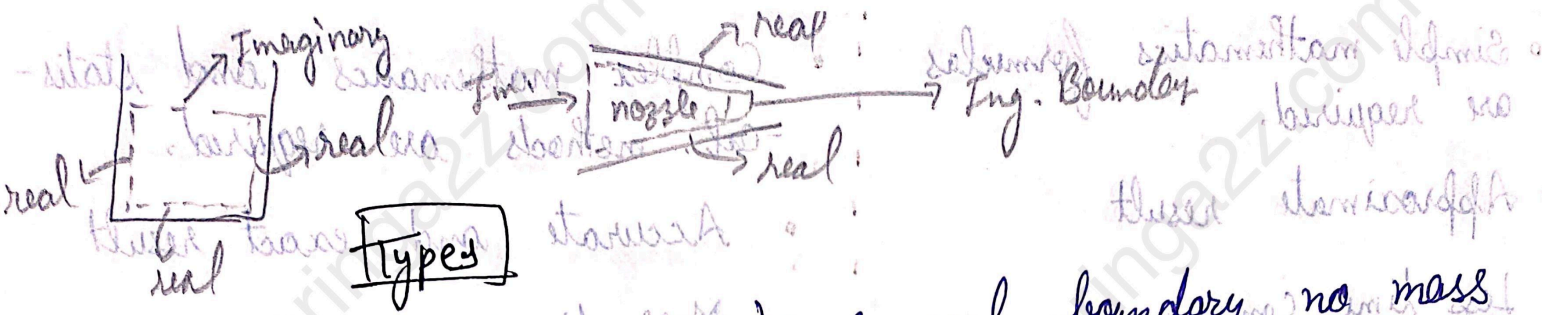
Everything external to the system

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.

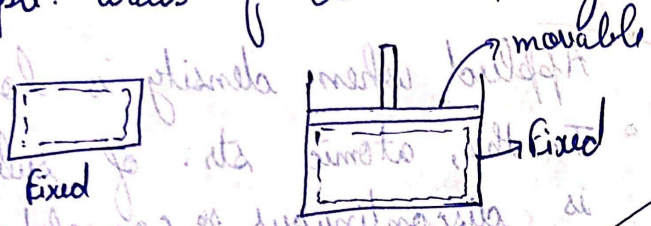




Types

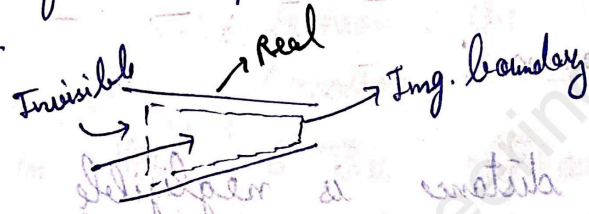
Real Boundary δ (fixed or movable): In real boundary no mass transfer is possible.

Exmpl: Walls of classroom, cylinder piston with no valve.



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

Ex.- Open beaker, nozzle.



* Classification of Boundary:

→ On the basis of movement

- | | |
|---|--|
| <p>1) <u>Rigid (fixed)</u></p> <ul style="list-style-type: none"> • Dimension of boundary is fixed. • ex.- Boundary of room | <p>2) <u>Flexible (movable)</u></p> <ul style="list-style-type: none"> • 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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