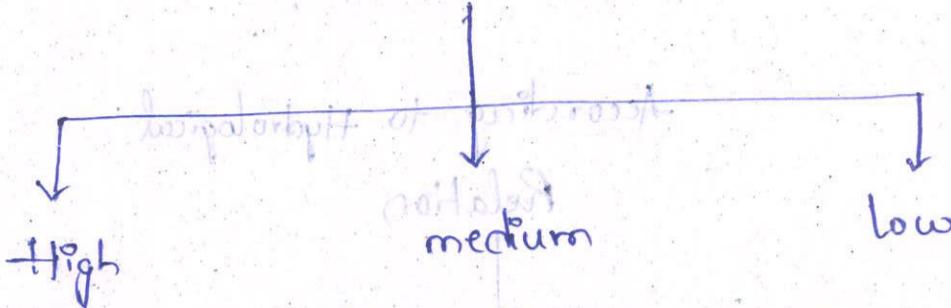


UNIT - IV

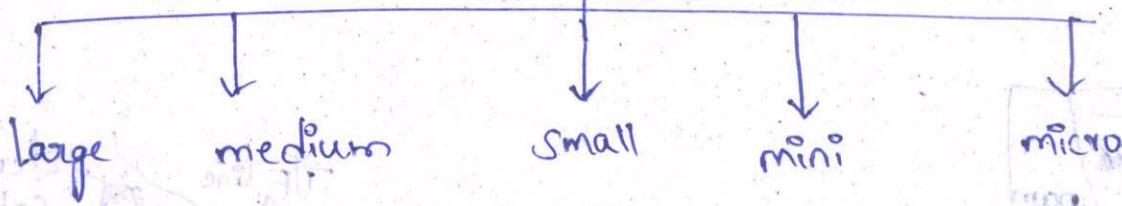
Hydro Electric power plants

* Classification :-

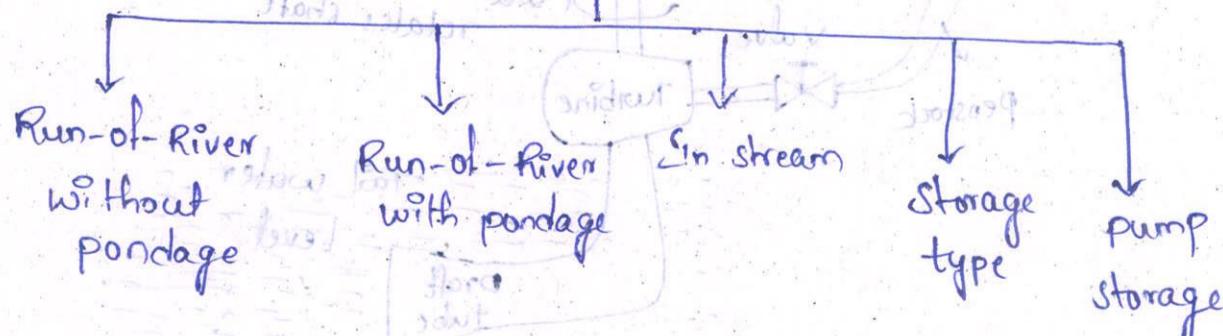
1. According to Availability of head



2. According to capacity



3. According to facility type



4.

According to purpose

Single

multi

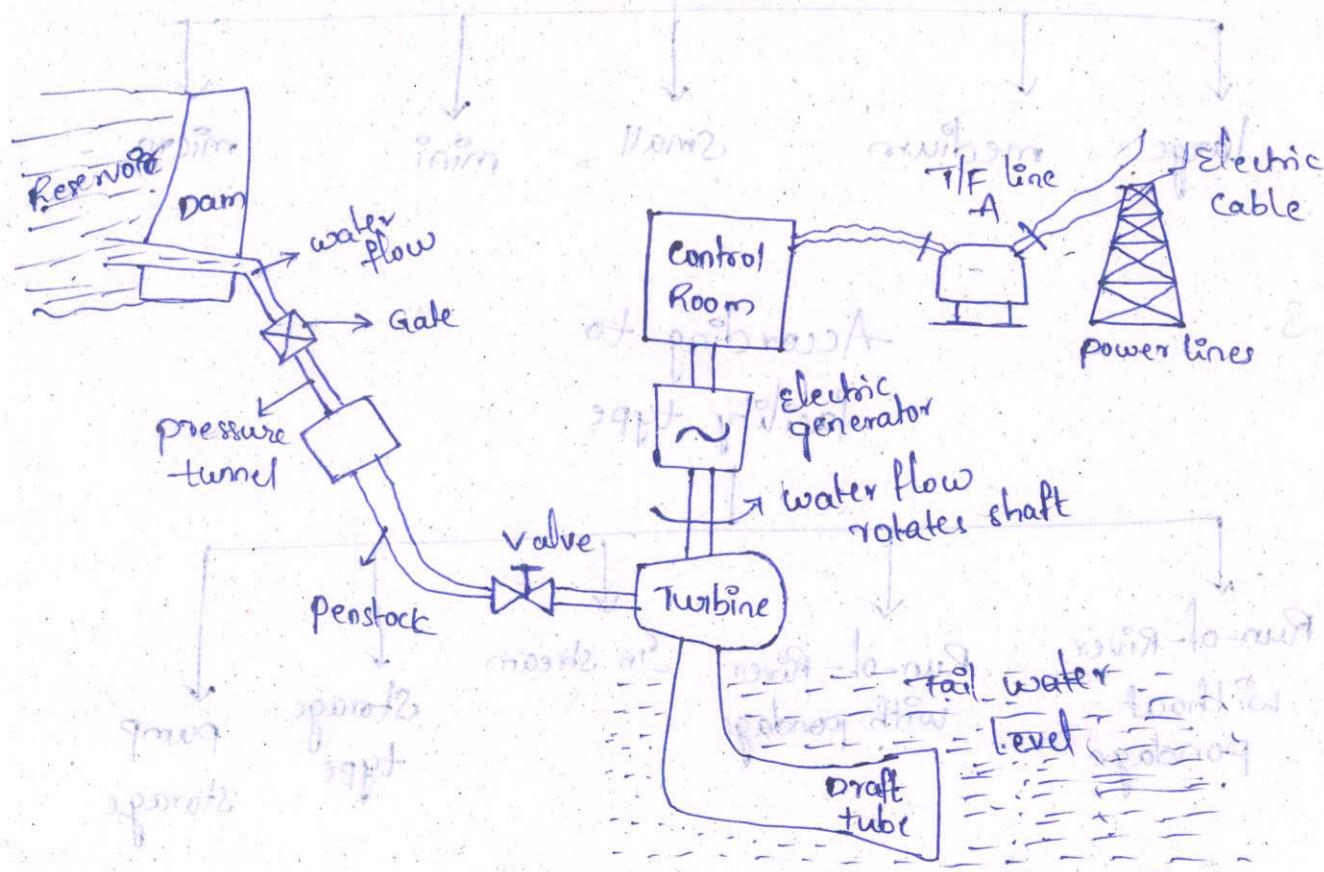
5.

According to Hydrological Relation

single stage

cascade

* layout and components



Lay out of Hydro power plant

* Principles of wind

Introduction :-

- winds are horizontal movement of air from an area of high pressure (H) to an area of low pressure (L). out of sub-bounding area shows local winds.
- Wind Energy is a kinetic energy associated with movement of large masses of air without water.
- It is clean, cheap, and eco-friendly renewable source.
- Wind energy is utilized as mechanical energy with the help of a wind turbine.
- Moderate to high-speed winds, typically from 5m/s to about 25m/s are considered favourable for most wind turbines.
- Moderate to high-speed winds, typically from 5m/s to about 25m/s are considered.
- The electric power generation through wind was first proposed in Denmark in 1890.

Origin of winds :-

- * The origin of winds may be traced basically to uneven heating of the Earth's surface due to sun.
- * This may lead to circulation of widespread winds on a global basis, producing planetary winds or

may have a limited influence in a smaller area to cause local winds.

Local winds :-

Localized uneven heating of air responsible for local winds are produced due to two mechanisms:

i) Due to differential heating of land surface and

water bodies due to solar radiation.

ii) Due to differential heating of slopes on the

hill-sides and that of low lands.

* Tidal :- Tidal power, also called TIDAL ENERGY, is a

form of hydropower which converts potential energy

of tides into the useful form of power, mainly

in electricity.

→ Tides are the waves caused due to gravitational

pull of the moon and sun.

→ Ocean tides are the periodic rise and fall

of ocean water level occurs twice in each

lunar day.

→ During one lunar day the ocean water level

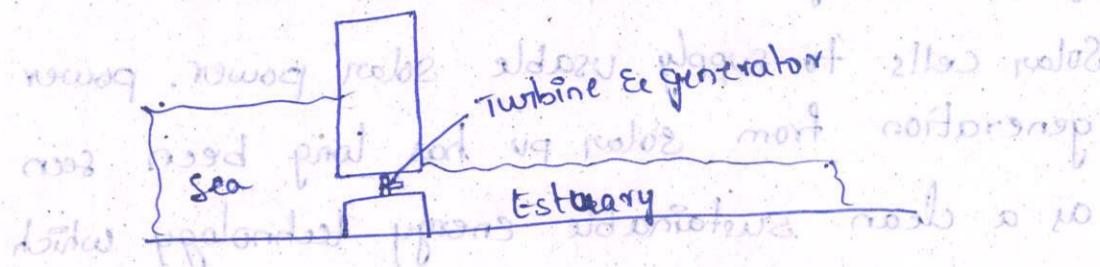
rises twice and falls twice and fall twice.

Tides: ~~water moving water moves~~ ~~water moving~~

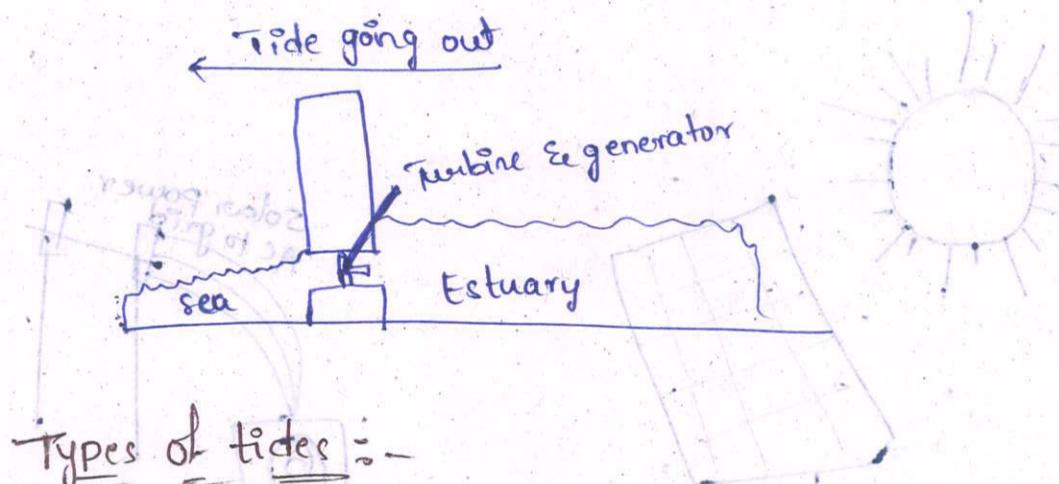
This tidal electricity generation works as the tide comes in and again when it goes out.

So this is tidal energy. At tides both

In \rightarrow Tide coming in \leftarrow tide going out



The water flows from the sea into the estuary. The turbine is driven by the power of the sea in both directions.



Types of tides :-

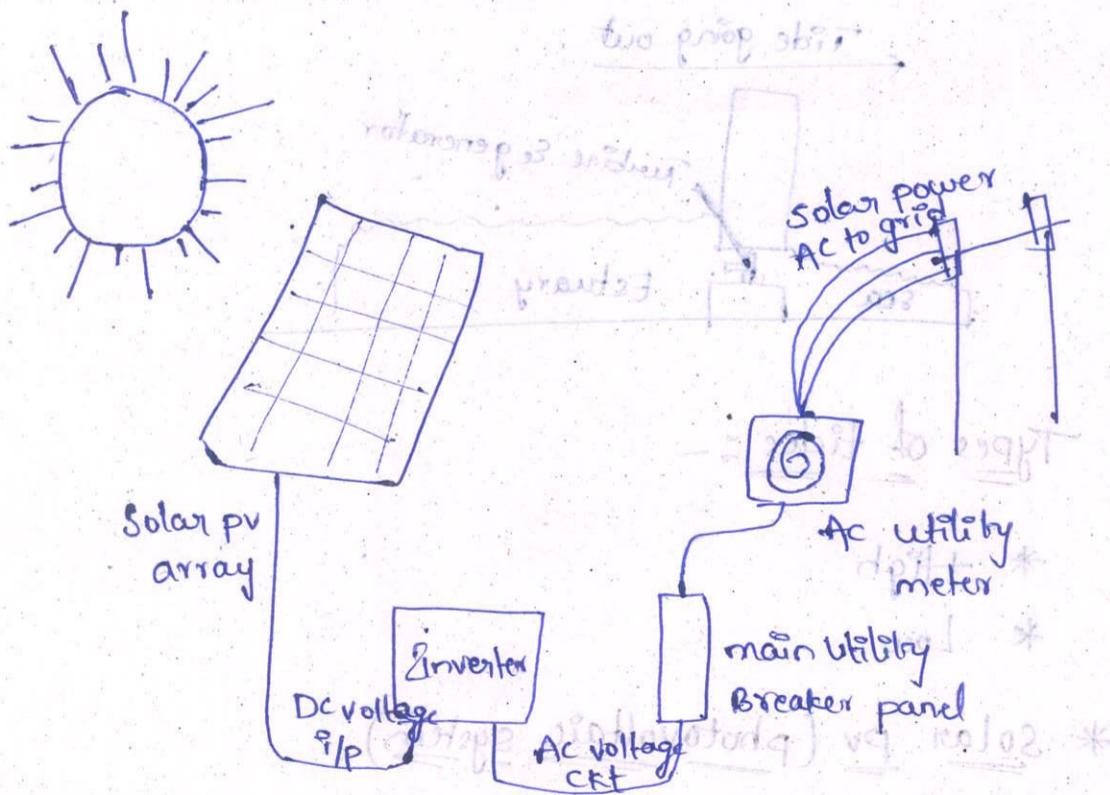
- * High

- * Low

- * Solar PV (photovoltaic system)

A photovoltaic system, also photovoltaic power system, solar PV system, PV system or casually solar array, is a power system designed to supply usable solar power by means of photovoltaics.

photovoltaic system also photovoltaic is a method of converting solar energy into direct current electricity using semiconducting materials that exhibit the photovoltaic effect. A photovoltaic system employs solar panels composed of a no. of solar cells to supply usable solar power. power generation from solar pv has long been seen as a clean sustainable energy technology which draws upon the planets most plentiful and widely distributed renewable energy source - the sun.



* Solar thermal

solar power plant is based on conversion of sunlight into electricity, either directly using photovoltaic (PV), or indirectly using concentrated solar power (CSP), or a combination.

Concentrated solar power system use lenses or mirror and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using photovoltaic effect.

Passive :-

A passive system requires no equipment, like when heat builds up inside your car when it's parked in the sun.

Active :-

An active system requires some way to absorb and collect solar radiation and then store it.

EM :- solar thermal power plants.

Geothermal

* Geothermal :-

Geothermal is heat energy of the Earth.

It's simply the heat energy of the Earth, generated by various natural processes, such as:

1. Heat from when the planet formed and accreted, which has not yet been lost.

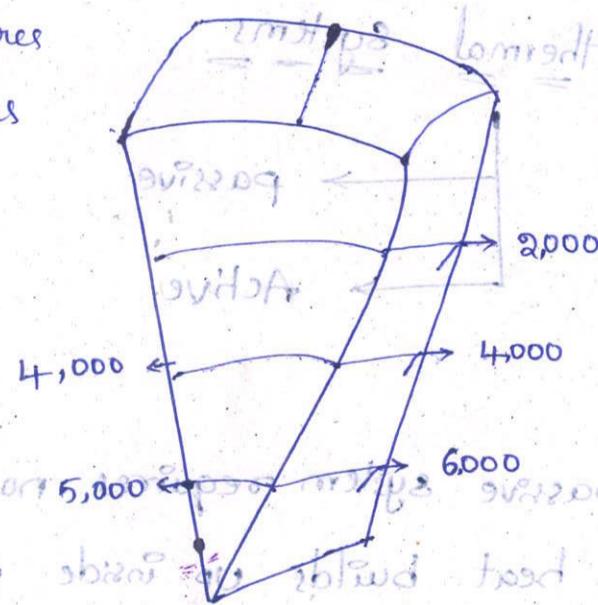
2. Decay of radioactive elements

3. Friction.

Temperature in the Earth

Temperatures
in Celsius

Depth in
kilometers.



The deeper you go, the hotter it is!!

Geothermal reservoirs can be suspected in the areas where we find:-

- Geyser
- Boiling mud pot
- Volcano
- Hot springs.

Extraction & Uses :-

The heat energy can be brought to Earth surface by following ways. \rightarrow after plugging report

- \rightarrow directly from hot springs / geysers
- \rightarrow geothermal heat pump

Uses are broadly classified as:

- \rightarrow direct use
- \rightarrow indirect uses

Advantages :-

- * Available all the year around
- * Does not involve any combustion of fuel
- * Independent of weather
- * Clean Resource - very little emission or overall environmental impact.
- * Overall, geothermal energy is a sustainable resource.

Disadvantages :-

- * Not widespread source of energy

- * can run out of steam

- * may release harmful gases

- * Transportation

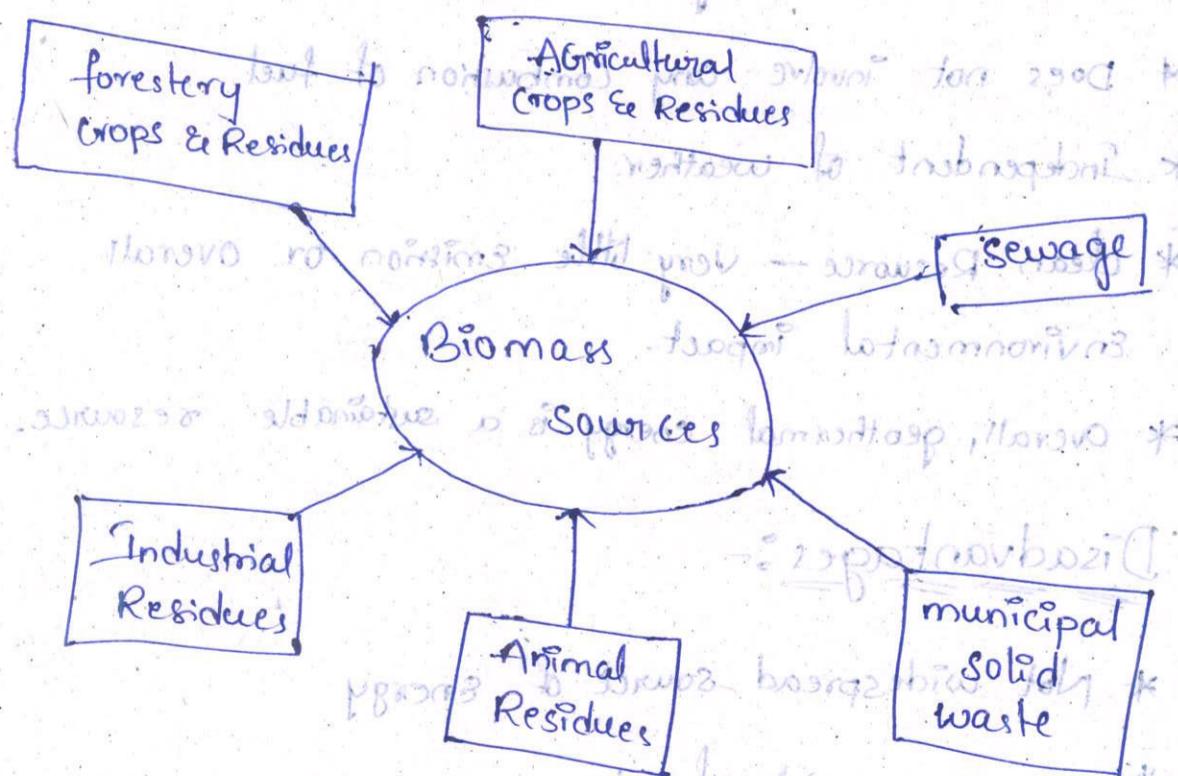
- * High installation costs

- * Earthquakes, of sub lateral to shear flow

- * Subsidence

* Biogas Energy:-

- Biogas typically refers to a mixture of different gases produced by the breakdown of organic matter in the absence of oxygen.
- Microbially controlled production of biogas is an important part of the global carbon cycle.
- It is a renewable energy source.
- The main source of raw material for production of biogas is plant and animal biomass.

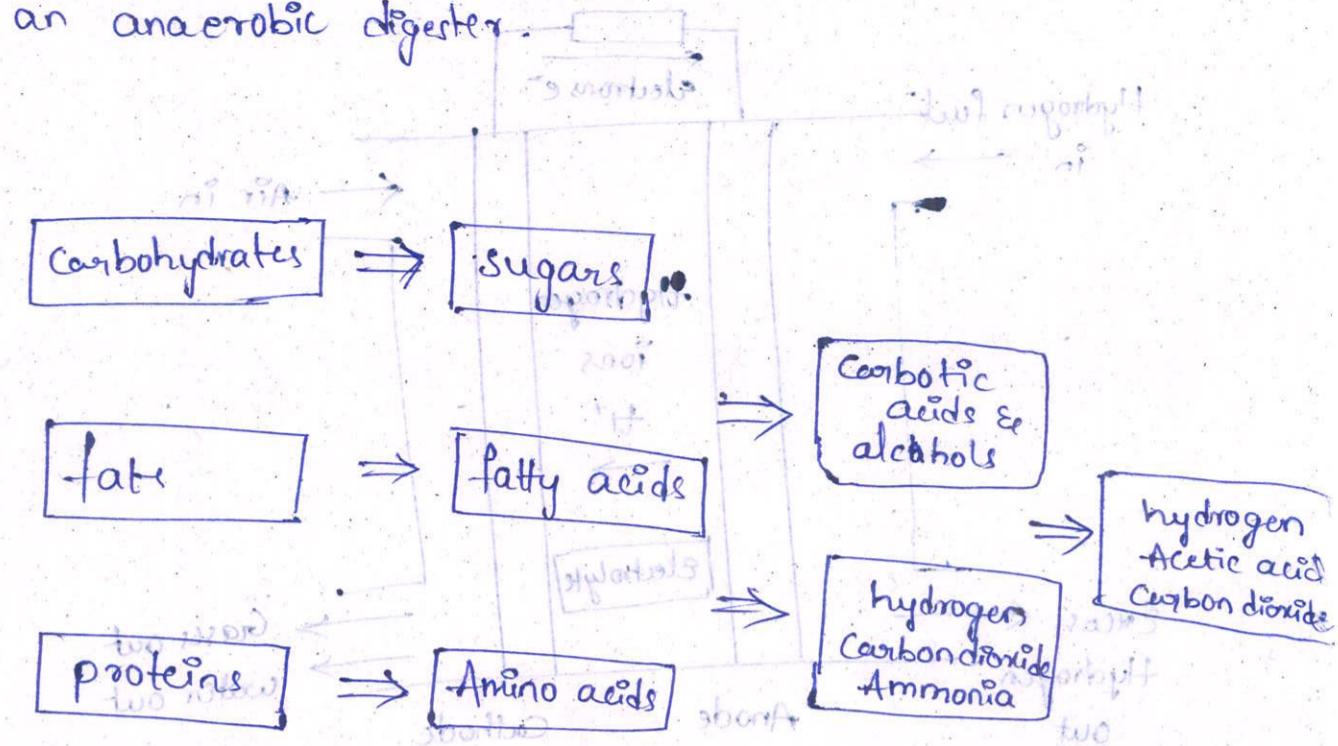


production :-

Biogas is produced as landfill gas (LFG)

which is produced by the breakdown of biodegradable waste inside a landfill due to chemical reactions and microbes, or as digested gas, produced inside

an anaerobic digester.



Biogas is produced by four steps:-

- * Hydrolysis
- * Acidogenesis
- * Acetogenesis
- * Methanogenesis

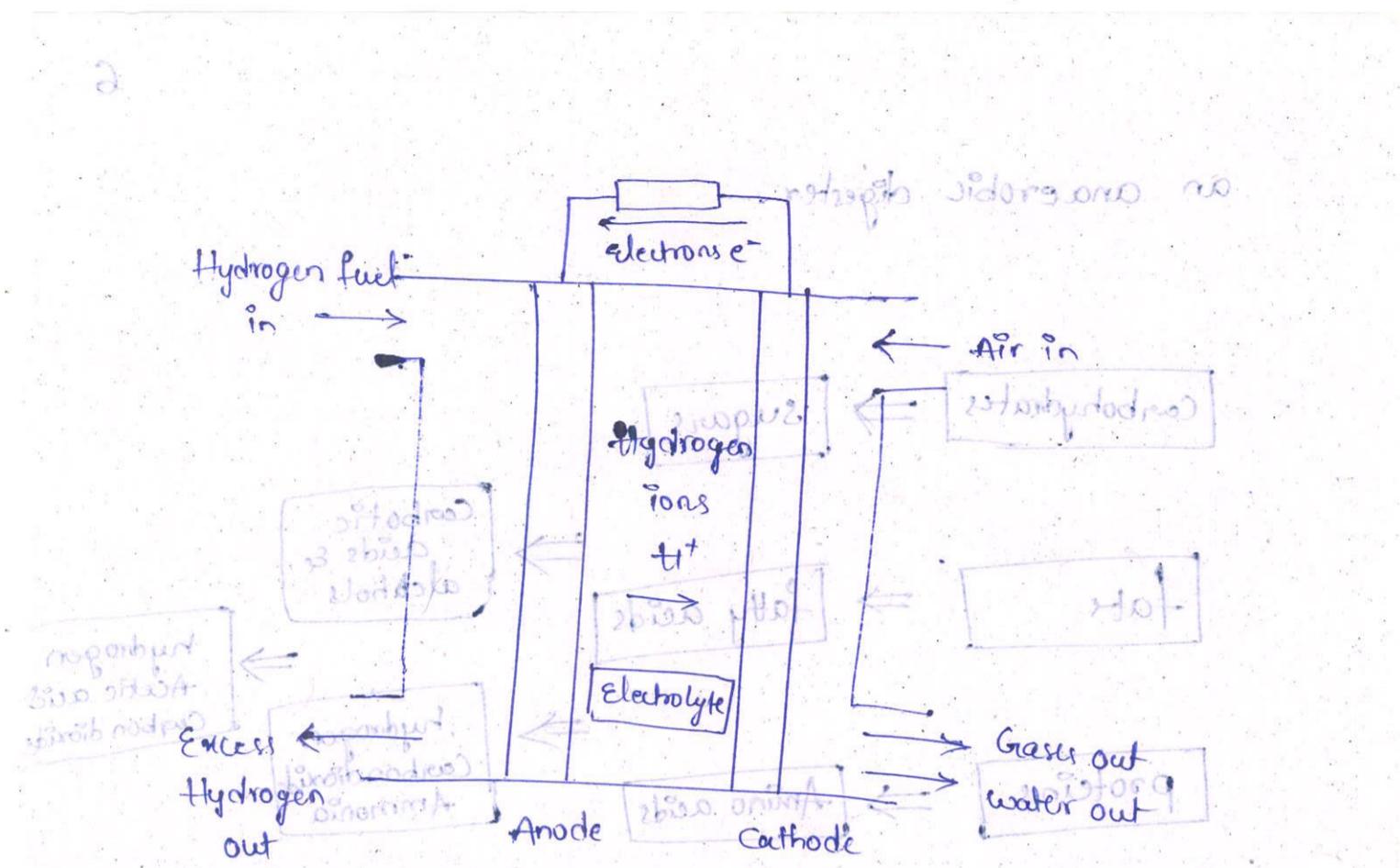
* Fuel Cells :-

→ A fuel cell is an electrochemical device that converts energy produced from a chemical reaction into electrical energy.

→ More specifically it is an electrochemical device that combines hydrogen and oxygen to produce electricity, with water and heat as its by product.

→ Chemical Energy → Electricity Energy.

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External Electrical path-way.