UNIT-5

(1) Explain about Hybrid Vehicles? (A/M-2014)

A hybrid vehicle has two or more power sources, which gives a large number of variants.

There are two basic arrangements for hybrid vehicles, such as

(a) Series hybrid Vehicle
(b) Parallel hybrid Vehicle

Series hybrid Vehicle:

Series hybrids have also been referred to as Extended Range Electric Vehicles (EREV) or Range Extended Electric Vehicle (REEV), where they are designed to run mostly by the battery.

A modern series-hybrid Electric Vehicle contain

* Electric traction - Using only one or more electric motors to turn the wheels.
* Combustion engine - That turns only a generator.
* A battery bank - which acts as an energy buffer.

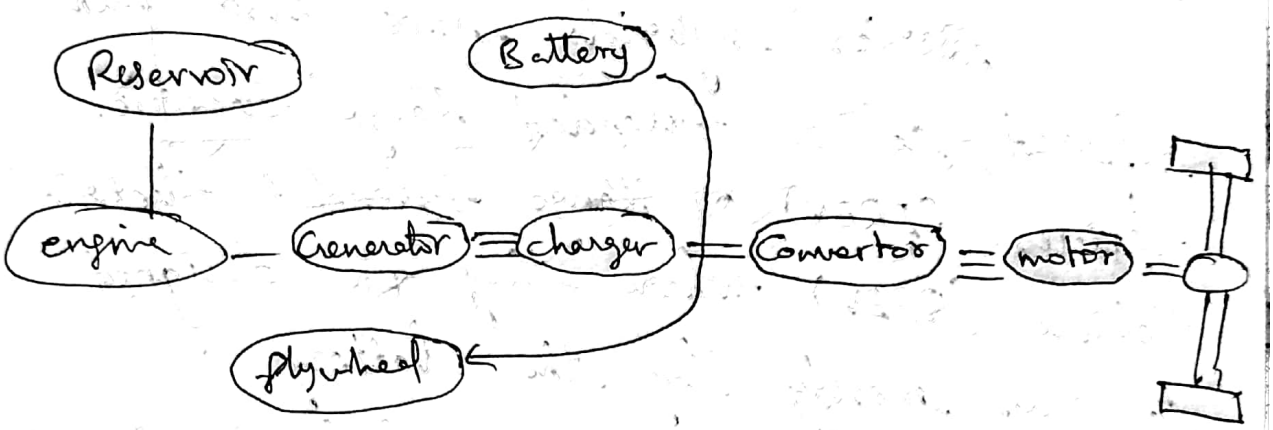
Parallel hybrid Vehicle:

Parallel hybrid systems, which are most commonly used at present, have both an

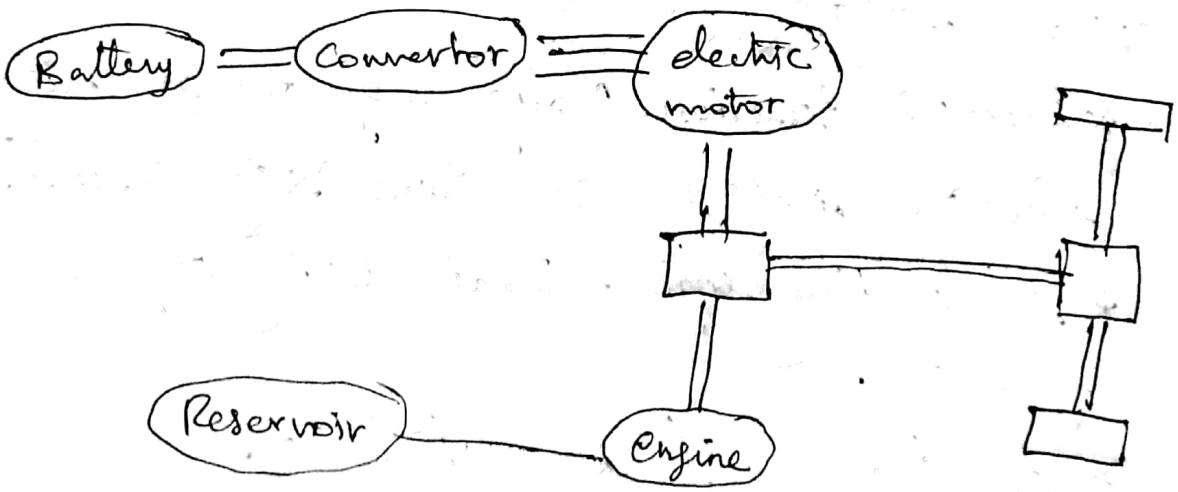
(i) Internal combustion Engine (ICE)

(ii) Electric motor coupled.

If they are joined at an axis in parallel, the speeds at this axis must be identical and the supplied torques added together.



Series vehicle



Parallel vehicle

(2) Enumerate the advantages and disadvantages of using alcohol as a fuel? (A/M-2014)

Advantages of Alcohol as a fuel:

* It is a high octane fuel with anti-knock index numbers of over 100.
* Alcohols have higher flame speed.
* It produces less overall emissions compared to gasoline.
* It is cheaper and more efficient.
* Alcohol does not damage the environment (i.e) alcohol is 98% pollution free, which reduces global warming.
* It can be obtained form a number a sources, both natural and manufactured.
* Many different plant sources can be used to produce alcohol, Sugar cane extract molasis, Cone etc).

Disadvantages of Alcohol as fuel:

* Alcohols have a low energy content or in other words the calorific value of the fuel is almost half.

* Alcohol is much more corrosive than gasoline on copper, brass, aluminium, rubber, and many plasters.

* It has poor cold weather starting characteristics due to low vapour pressure and evaporation.

* Alcohols have poor ignition characteristics in general.

* Larger quality of fuel is required to produce a specified power output (i.e) it should be 99.7% pure.

(3) Explain briefly Fuel cell? (N/D -2015)

Fuel cells produces electricity directly from the reaction between hydrogen and oxygen from the air.

Types of fuel cells:

The fuel cells are mainly classified based on the usage.

(i) Proton Exchange Membrane Fuel cell: (PEM)

Application: PEM fuel cells are used primarily for transforation and some stationary applications.

(ii) Direct Methanol Fuel cell: (DMFC)

DMFC are a subcategory of proton exchange fuel cells, in which methanol is used as the fuel. Their main advantage is the ease of transport of methanol.

(iii) Alkaline Fuel cell: (AFC)

AFC were one of the first developed fuel cell widely

used for space research program.

(iv) Phosphoric Acid Fuel cell (PAFC):

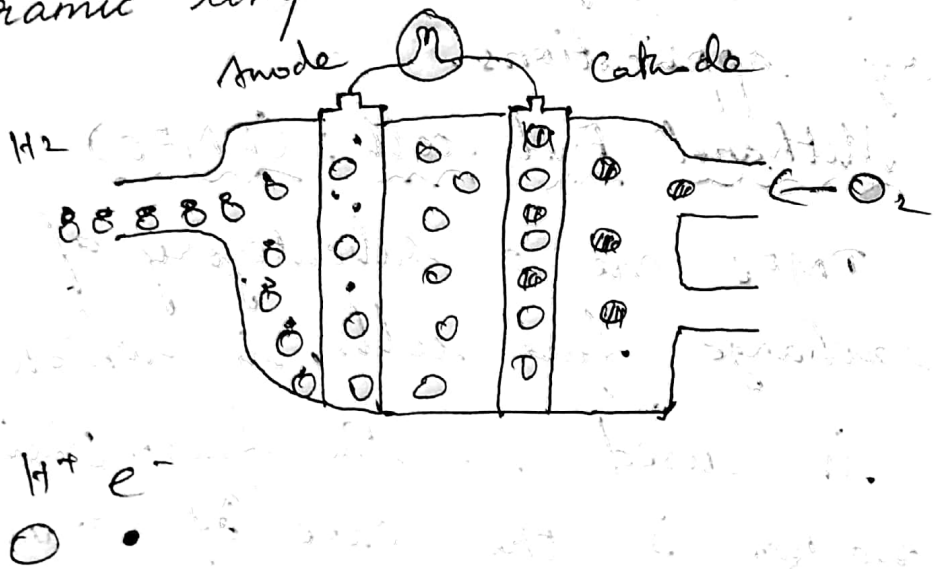
PAFC is a type of fuel cell that uses liquid phosphoric acid as an electrolyte.

(v) Molten Carbonate Fuel cell: (MCFC)

MCFC are high-temperature fuel cells that operate at temperatures of 600°C and above.

(vi) Solid oxide Fuel cell: (SOFC)

It uses a hard, non-porous ceramic compound as the electrolyte.



④ Explain briefly about the history, current uses, process of utili and advantages of biomass, as a fuel. (CM/JJ-2014)

Biomass is a biological material derived from living organisms. (i.e) plants and plant based materials.

The exploration of fuels like gas, coal, and the oil production and use of biofuel suffered a severe impact.

current uses:

cultivated biomass:

The cultivated biomass includes, which are produced by

* Sugarcane crops, sugar beach.
* Herbaceous emus crops, which are non woody plants.
* Forest crops of fast growing energy, intensive trees specially grown.

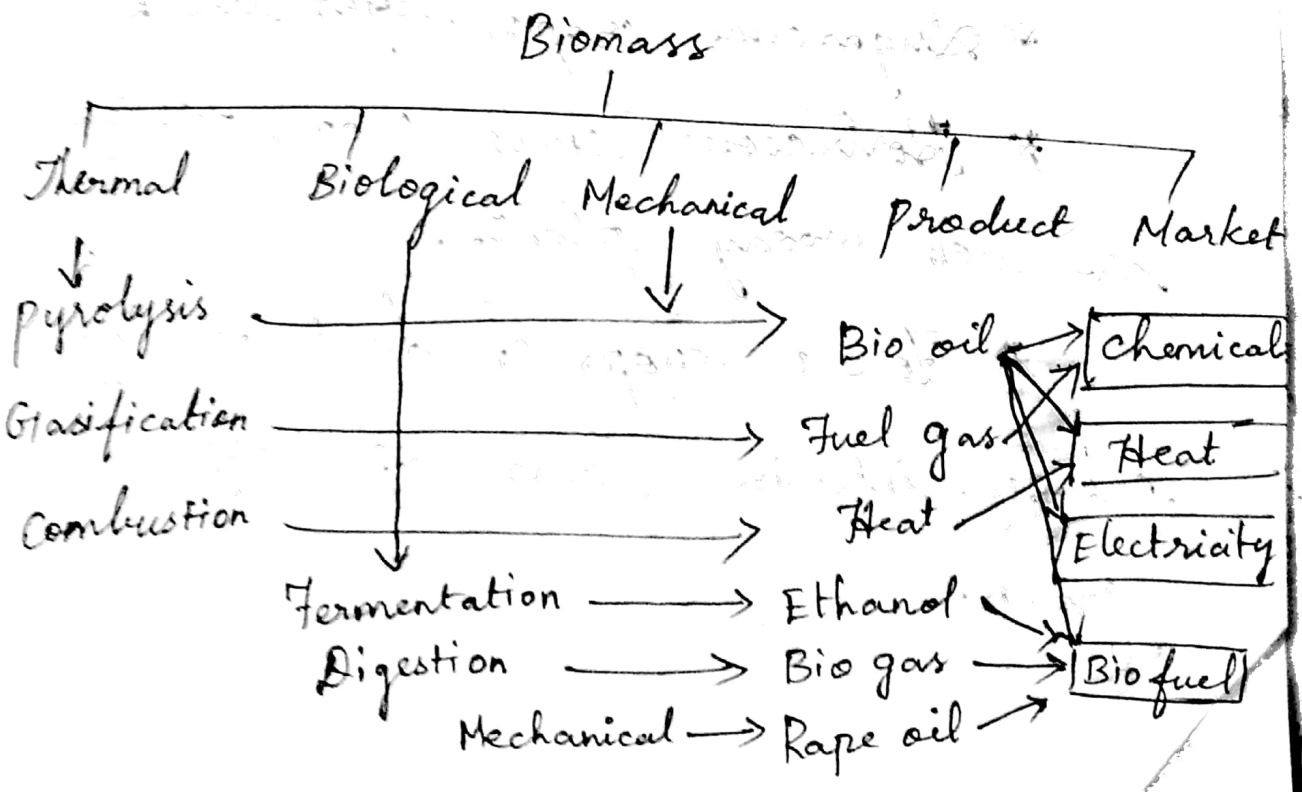
Biomass from Wastes:

Biomass can be produced by using the Urban municipal Waste, industrial organic and process Waste, Agricultural farm Waste, rural animal Waste, forest Waster, fishery, poultry Waste, and animal Waste.

Advantages of biomass of fuel:

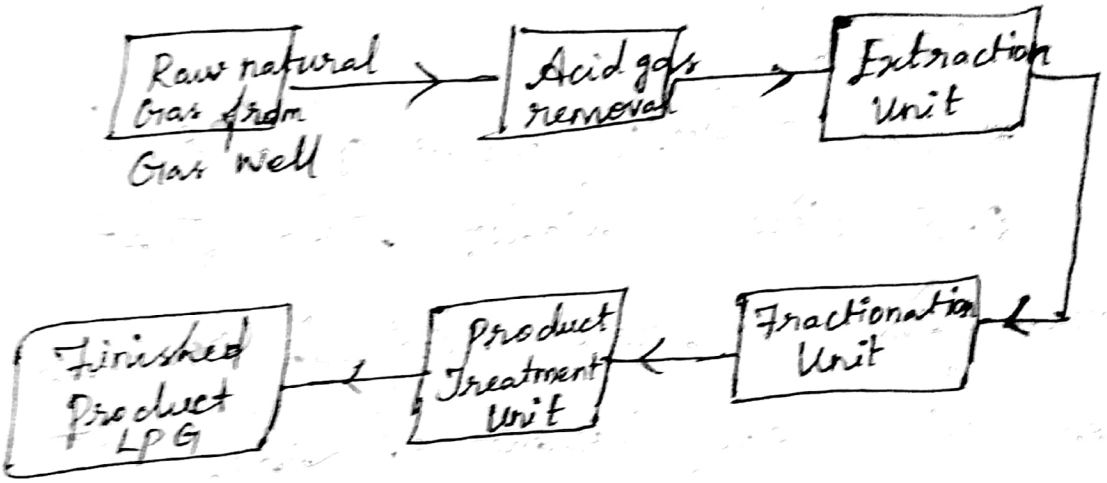
* Biomass reduces dependency on fossil fuels.
* Biomass products are abundant and renewable source.

Process of utilization:



⑤ Explain the production of liquefied petroleum gas: (LPG) [A/M-2016]

* LPG is produced by fractionation of natural gas liquids and from crude oil by distillation, catalytic cracking.



LPG Properties:

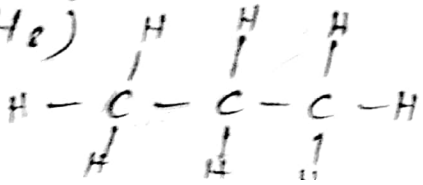
* LPG is a mixture of hydrocarbons. (primary propane and butane).

* LPG is odourless, colourless and non-toxic.

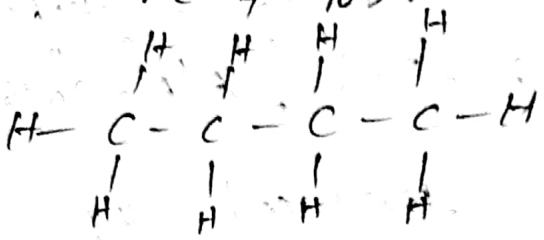
Properties of LPG:

LPG is a mixture of two types of hydrocarbon gases, such as

(i) propane (C_3H_8)



(ii) Butane : (C_4H_{10}).



* Boiling point : -42°C to 0°C.

* Ignition temperature: The temperature required to ignite LPG in air is around 500°C.

* The Calorific Value of LPG is about 2.5 times higher than that of main gas so more heat is produced from the same volume of gas.

Advantages of LPG:

* LPG has low sulphur level.

* It has very high octane number.

* High calorific Value.

Disadvantages:

* LPG tank occupies more space than gasoline tank.