

# Geothermal

20/09/19 (1)

Greek word

Geo (earth) - Therme (heat)

Heat of earth

Interior is very hot → So make use of this geothermal energy

Volcanoes - Gairmyer

Temp of Core -  $4000^{\circ}\text{C}$

Active Volcanoes erupt lava -  $1200^{\circ}\text{C}$

Temp of Hot Springs  $350^{\circ}$

Heat 1 ~~Cold~~ to heat

∴ Go Hotter to Colder

Temp increase with depth  $30^{\circ}\text{C}$  per km

drill 10 km deep 'Production wells' to obtain geothermal fluid

Geothermal energy ~~at~~ ~~in~~ ~~the~~ of earth is in the following forms

(i) Hot water springs

(ii) The Geysers - Hot water & steam

(iii) Fumaroles - Hot steam and Hot gases

(iv) Volcanic Volcanoes

Advantages:-

(i) It is reliable source of energy which is available continuously through the year

(ii) it is independent of weather conditions

(iii) Capital and generation cost is low as compared to conventional thermal power plants

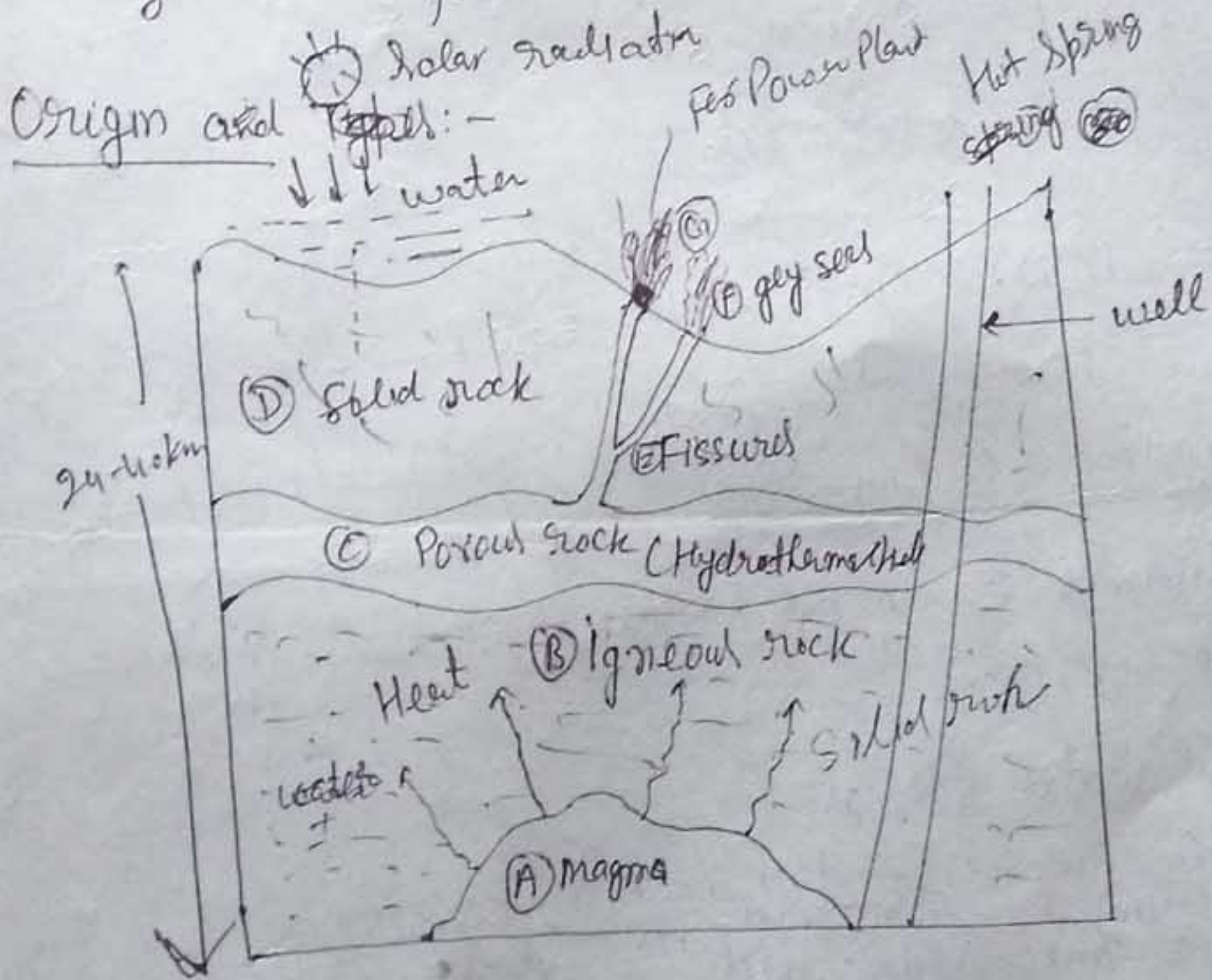
(iv) No solid pollutants

(v) need very small land area,

(vi) Power generation is more than wind and solar energy

Disadvantages:-

- (i) it is a low grade heat energy
- (ii) Geothermal fluid also bring in dissolved gases like  $H_2S$ ,  $CO_2$ ,  $NH_3$  gas and other salute which causes air pollution.
- (iii) life of plant is low compared to conventional power plants
- (iv) noise pollution result from the drilling operation in geothermal fields.



igneous - Latin word mean - of fire  
 magma -

Fig show the typical geothermal field. The earth is made up of a central core of a radius of about 1350 km and is estimated to be at  $4000-10000^{\circ}\text{C}$

The interaction of temp and pressure change results in the melting of some rocks of upper mantle to form 'magma'. The hot magma near surface (A)

solidified into igneous rock (B). The heat of the magma is conducted upward to this igneous rock. The ground water that finds its way down to this rock through fissures in it will be heated by the heat of the rock or by mixing with hot gases and steam emanating from magma.

The heated water will then rise upward and into a porous and permeable reservoir (C) above the igneous rock. It is covered by the layer of solid rock (D). It traps the hot water in the reservoir called hydrothermal field. This solid rock, however has fissures (E) that act as vents of the underground boiler.

The vents show up as geysers ~~fumaroles~~ fumaroles.

A well (M) taps steam from the fissures for use in a geothermal power plant.

There are two types of geothermal steam

① magmatic steam: - Steam originating from the magma itself

② Meto meteoritic form: - Steam produced from ground water heated by the magma

# Types of Geothermal Resources:-

- ① Hydrothermal
- ② Hot dry rock (HDR)
- ③ Geopressurised
- ④ Magmas

Only Hydrothermal energy is being presently utilized since the technology for commercial utilization and other energy source is not available.

Types of Geothermal Systems (Power Plants) :-> ①

3 General categories of geothermal sources have been identified

(1) Hydrothermal ~~Conv~~ System

(A) Vapour Dominated or Dry Steam ~~System~~ Field

(B) Liquid dominated (Wet Steam Field)

~~(C) Hot water resource~~

(2) Geopressure Resources

(3) Petrothermal System or Hot dry Rocks (HDR)