

Q.1 ⇒ Geothermal energy.

Ans ⇒ → The earth is a great reservoir of heat energy in the form of matter interior.

→ Surface manifestation of this heat energy is indicated by hot water springs and geysers discovered at several places.

→ Heat can be experienced from the temperature rise of the earth's crust with increasing depth below the surface.

→ Radial temperature gradient increases proportionally to depth at a rate of about  $30^{\circ}\text{C}$  per km. At a depth of 3-4 km water bubbles up, while at a depth of 10-15 km, the earth's interior is as hot as  $1000^{\circ}$  to  $1200^{\circ}\text{C}$ .

→ The core of the earth consists of a liquid rock known as 'Magma' having a temperature of about  $4000^{\circ}\text{C}$ .

Limitless heat content in magma plus the heat generated by radioactivity decay of unstable elements such as  $\text{K}^{40}$ ,  $\text{Th}^{232}$  and  $\text{U}^{235}$  which are abundant in earth's crust are forms of geothermal energy and considered as a renewable energy resource.

\* Advantages  $\Rightarrow$  The emission of  $\text{CO}_2$  and  $\text{SO}_2$  by geothermal power plants is far less compared with conventional fossil fuel based power plants.

$\rightarrow$  It is almost pollution free.

$\rightarrow$  It is an inexhaustible source of energy.

$\rightarrow$  More reliable source of power generation than other renewable energy source.

\* Disadvantages of geothermal energy  $\Rightarrow$

$\rightarrow$  Geothermal fluids often contain significant quantities of gases such as  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{N}_2$ ,  $\text{NH}_3$  and  $\text{H}_2\text{S}$ . The  $\text{H}_2\text{S}$  as well as dissolved chemical can sometimes be acidic.

$\rightarrow$  Noise pollution before the during of boiling.

$\rightarrow$  Plants are located at far distance from location of application. This causes more losses in power as well as thermal losses. or pressure drops in pipe, while transferring hot fluids (water or steam) for direct use.

$\rightarrow$  The underground water depletion may occur at low rainfall areas if water is not re-injected back.