

## ENERGY FLOW IN ECOSYSTEM

Q. Describe how energy flow is governed by two Laws of thermodynamics?

The existence of life depends up on the flow of energy and circulation of mineral in an ecosystem. The essence of life is the progression of changes such as growth, reproduction etc. which are accompanied by the transfer of energy without energy transfer there could be no life and life is what sets the ecosystem apart from the other natural system and hence there could be no ecosystem. This ecological process of energy flow is regarded as the "Heart of the ecosystem dynamics".

In an ecosystem Sun is the ultimate source of energy. The radiant energy of sun when reaches earth's surface in the form of electromagnetic waves, about 30% of it, is reflected back to space, about 50% of it is absorbed as heat by ground. Vegetation or water and about 20% is absorbed by the atmosphere. Infact only about 20% is absorbed 0.021% of the total solar energy reaching the atmosphere is used in photosynthesis. This radiant energy of sun is converted into chemical or potential energy by the photosynthesis or chemosynthesis.

All the biological world, obtain and transformation its potential energy from organic substance (Carbohydrates, Protein, Fat) produced by plant, through a linearly arranged

ged chain called food chain.

In an ecosystem the transfer and transformation of energy at different trophic levels is governed by two laws of thermodynamics.

These two laws states as follows-

1. According to first law of thermodynamics  $\rightarrow$  Energy can neither be created or be destroyed but transformed from one form to another. This is also known as conservation of energy.

2. According to second law  $\rightarrow$  "The process involving energy transformation will not occur spontaneously, unless there is a degradation of energy from a more random to a less random form." It means that whenever energy is transferred from one trophic level to another in the form of potential energy (i.e. food) a large part of that energy is degraded as heat (i.e. respiration) and there is a net increase in the disorder of energy i.e. unavailable energy is known as Entropy. Hence this law is also known as "Law of entropy."

In an ecosystem the flow of energy occurs from one trophic level to another in succession. A trophic level is the number of links by which it is separated from the producer in the food chain. The pattern of eating and being eaten forms a linear chain called Food chain which can be always be traced back to the producer. Thus pri. producer

(green plants) trap radiant energy and transform that to chemical or potential energy (carbohydrate, protein, fat). When Herbivores eat a plants these organic complexes oxidized to liberate energy which is equal to energy consumed in the synthesis of these compounds. This proves the first law of thermodynamics. But at the same time some of the energy is lost as heat, in respiration and are not useful energy (second law of thermodynamics) when this animal is turn is eaten by another one useful along with transfer of energy herbivore to carnivorous further decrease in useful energy occurs at the second animal (carnivore) oxidized to liberate energy to synthesize its own cellular constituents. Such energy transform from organism to organism sustains the ecosystem and when energy is transferred in a particular community as in pond or lake or in ~~the~~ river, we come across the food chains. Basically two types of food chain are ~~seen~~ recognised —

- ① Grazing food chain &
- ② Detritus food chain.

The energy is transferred