Chapter # 25
Ecosystem

Q.1.(a) The Quranic injunction explains about the blessing of God.

Ans. The Quranic injunction is

وَتَرَى الْأَرْضَ هَامِدَةً فَإِذَا أَنْزَلْنَا عَلَيْهَا الْمَاءَ اهْتَزَّتْ وَرَبَتْ وَأَنْبَتَتْ مِنْ كُلِّ زَوْجٍ بَهِيجٍ ۝

"And thoud (Muhammad) seest the earth barren, but when We send down water theron. It doth thrill and swell and put forth every lovely kind (of growth)" (Al-Quran 22:5)

Q.1.(b) Describe ecology. What is ecosystem? What is difference between population and community?

Ans. ECOLOGY

The term ecology formed from Greek words "oikos" meaning the family household and "logy", meaning "the study of". This term originally was formed by the German zoologist Ernst Haeckel in 1866. He called it oecologic. He defined it as the study of the relationship of animals (organism) to their environment. This relationship includes interactions with the physical world and with members of other species and the same species.

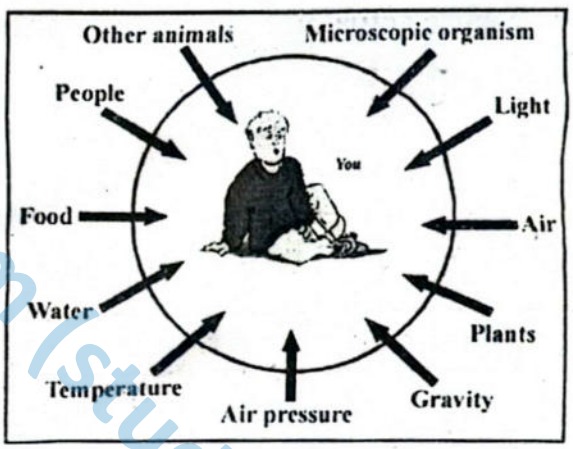


Fig. Your environment

ECOSYSTEM

The eco part of word is related to environment and system part means a collection of related part that function as a unit.

Population:

It is a group of inter breeding individuals occurring together in space and time. Populations compete with each other for resources such as food, water, space etc. Sometimes they can give benefit also.

Community:

All populations within an ecosystem are known as community which are interconnected with each other.

Biomes:

Major regional ecological community of plants and animals forms biomes. There as six terrestrial biome, forest, grassland etc.

Fig. (a) A population of birds Fig. (b) A community

Q.2.(a) Write a note on Biosphere?

Ans: BIOSPHERE:

It is a thin layer of earth where all the living things live.

All the organisms in biosphere interact with each other and also change and control chemical and physical conditions of biosphere.

Habitat:

The actual place where an organism is called habitat.

Ecological Niche:

According to Charles Eton the niche is the basic role of an organism in community it play.

It is a profession or job of an organism. In the ecosystems organism and habitat different functions. Ecological niche and habitat tell how organism get energy and material.

Q.2.(b) Differentiate between Autecology and Synecology.

Ans. Autecology:

It is the branch of ecology in which single populations relation to its environment is studied.

Example.

If one population of soybean plant with 50 to 100 plants are studied then it is autoecology.

Synecology.

The study of different communities with the relationship to their to environment is called synecology.

Example.

The study of growth responses of plant is called synecology as there are many factors in growth which interact with each other.

Difference between synecology and autecology:

If we study one population then it is autecology but if we study all populations at same time then it is synecology.

Q.3. Discuss about the different component of ecosystem. How do they interact?

Ans. Basically there are two main component of ecosystem.

(1) Biotic Components (2) Abiotic Components

1. Biotic Components:

Biotic components are those components which consist of all living things. Plants and animals are supported by biosphere. Biotic components are further divided into there subdivision.

(i) Producer:

These are green photosynthetic plants. These plants absorb the light energy in ecosystem and with its help prepare its organic food from simpler inorganic substances. Therefore they are autotrophic organisms.

(ii) Consumers:

Animals are called consumers and they cannot prepare their own food thus depends on producers. They are heterotrophic organisms.

Decomposers:

Fungi and bacteria are called decomposers. They can obtain their energy from dead and decaying plants and animals. They release chemical elements in the form of ions such as nitrates, ammonia, phosphates, potassium and calcium.

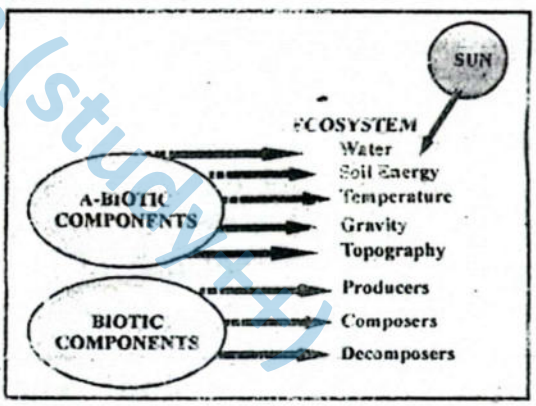
2. Abiotic Components:

All non living components are called abiotic components such as water air and soil. In ecological term they are divided as:

(i) Atmosphere: Atmo means air, sphere means place.

(ii) Hydrosphere: Hydro means water.

(iii) Lithosphere: Litho means earth soil.



Interaction of the components:

The components interact with each other during feeding, circulation of chemical elements and energy flow.

Food chain:

The series of steps of eating and being eaten of the organisms is called as food chain.

OR

The relationship between the organisms of eating and them being eaten is called food chain. In a food chain plants are the main source of food for organisms.

The food of eagle may be blue bird, while blue bird eats insect like caterpillar and cater pillar feeds on grass or green leaves.

Food web:

The combination of many food chains is called food web. As many of the animals eat more than one type of food at different times so food web is not straight as shown in fig.

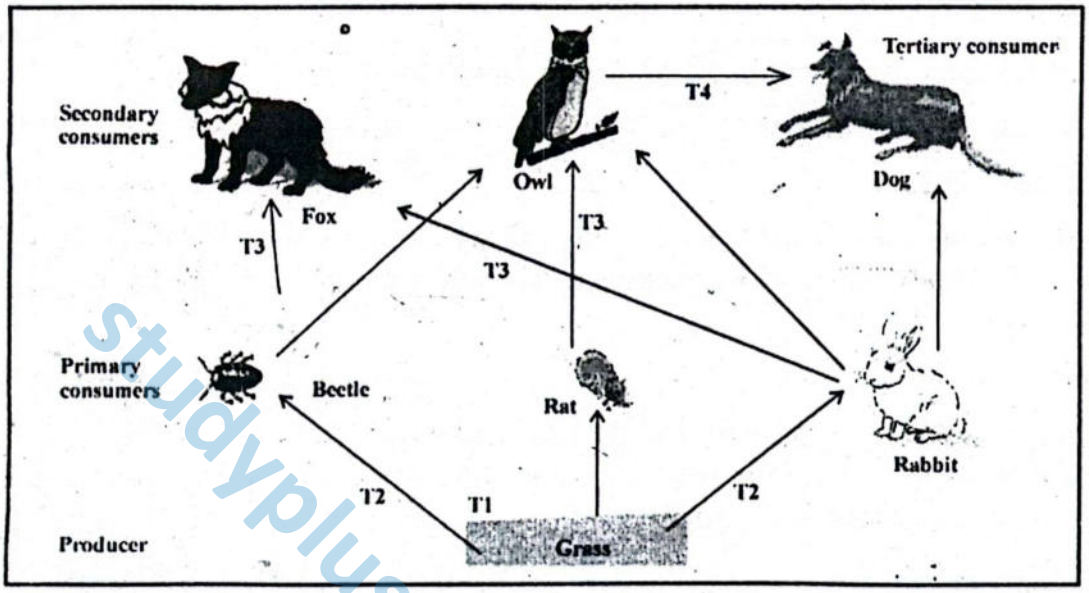


Fig. Food Web and various trophic levels

Trophic Level:

Food web shows complex trophic levels or food links. According to figure T_1 first trophic level which is always producers (green plant) T_2 is second trophic level which are primary consumers. Secondary consumer are placed in third trophic level T_3 while tertiary consumers are at fourth trophic level

Importance of Food web:

Food web is helpful to keep balance in the ecosystem. For example rabbits and mice are food of owls. If due to some environmental reasons or disease the rabbits population is affected then less plants will consumed. In this way a large plants population produces many fruits and seeds which will become a source of food of mouse population. This population of mouse will increase which in turn will become a big source of owls and ecosystem will be balanced.

Q.4. What is Succession? What are different types of succession?

Ans. SUCCESSION:

A change in the structure of community of an ecosystem over a period of time is called succession.

Changes in Succession

The change in the community takes place where the competitors and species can replace one another to get stability in the ecosystem which results in self sustaining climax community.

The changes of succession depends upon the environments where it occurs.

Types of Succession:

There are two types of successions in dry land.

(1) Primary succession (2) Secondary succession

1. PRIMARY SUCCESSION:

Primary succession starts from that place where there is no trace of life such as bare rock sand or glacial pool. Change requires thousands of years. Primary succession is further divided into three divisions.

(i) Hydrosere: The succession taking place in pond.

(ii) Derosere: Such type of succession occur in dry soil or rock.

(iii) Xerosere: Succession on dry habitat is called xerophytes. The plant of such habitat which are able to withstand prolonged period of water shortage. Succulent plants such as cacti can store large amount of water as their leaves are modified. The success in xerosere take place in following stages. In primary succession first organism to invade are hard drought resistant called pioneer organisms.

2. Secondary Succession

The formation of a new ecosystem after the disturbance of an existing ecosystem is called secondary succession.

Secondary succession is the establishment of new community where another community has been destroyed e.g. forest community undergoes clear cutting.

Stages of Secondary Succession:

In secondary succession the same principles are applied, but events occur more rapidly. Secondary succession is so rapid because previous community has left its mark in form of improved soil and seeds.

(i) Crustose Lichen Stage:

If any rock has protective layer for growth then special types of lichens get impregnated and form a crust. These lichens have the great ability to with stand extreme weather condition. Scarce rain or dewdrops can make their surface wet, they absorb water and become dormant.

(ii) Foliage Lichen Stage:

Lichens gradually break the rock surface and probe into tiny cervices. The area become rough with more and more fissures where sand start to accumulate. The growth of the lichens is reduced and dead lichens add to humus. In this way soil is born and with it come opportunities for grasses and mosses to establish themselves.

(iii) Moss Stage:

This is the third stage with mosses like polytrichum, Tortula etc. They compete with lichens for water and penetrate much deeper in soil as compared to lichens adding more humans to soil.

(iv) Herbaceous (Plant) Stage:

Small seedling of herbaceous plants now establish due to the more availability of moistures, humus and soil for anchorage.

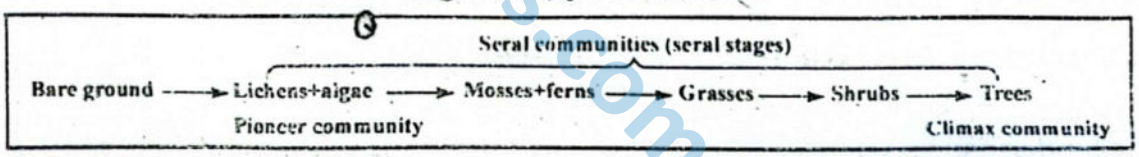
(v) Shrub Stage:

Shruby plants now start growing, dominating shadowing herbaceous plants which die to add more humus to soil.

(vi) Climax Forest:

At this stage soil has much improved which allows the growth of woody plants. The shade of these plants inhibit the growth of mosses, lichen etc. The establishment of woody forest is the climax stage of this region.

Fig. Primary Succession



Q.5. What are the different types of interaction in an ecosystem?

Ans. The different types of interaction in an ecosystem are:

1. Predation
2. Parasitism
3. Symbiosis
4. Grazing

1. PREDATION:

Predator:

A consumer that preys other animals is a predator.

Prey:

The animal which becomes the food of predator is called prey and this whole mechanism is called predation.

Interrelationship between prey and predator:

The size of predators and prey populations are related to each other. If the number of prey is large then the number of predators will increase which will decrease the number of prey as they will become the food of predator. On the other hand decrease in

the number of predator will increase the number of prey. In this way a cycle of food relationship will form

Examples:

(i) Cat is predator while mouse is its prey.

(ii) Rabbit is a prey of fox.

(iii) Frog mostly feed on mosquitoes.

2. PARASITISM:

Parasitism is a relationship in which organism feeds on tissues or body fluids of another organism.

Parasite and host interrelationship:

The organisms which feed on another organism is called parasite while on which it feeds is called host. The host provide food, protection and conditions for survival. The parasite may or may not harm the host. Diseases in living organisms caused by parasites are called infections. A large host population can support more parasites than small host population.

Types of Parasites:

There are two types of parasites.

(i) Ectoparasites:

They live outside the body of host. Examples of ectoparasites are mosquitoes feeding on blood of man, fungi causing dandruff in hair.

(ii) Endoparasites:

They live inside the body of host e.g. tape worm in intestine of man.

3. SYMBIOSIS:

Symbiosis is a relationship in which both of the organisms live together closely. It is further divided into two forms.

(i) Mutualism (ii) Commensalism

(i) Mutualism:

It is that type of symbiotic relationship in which both species get benefit.

Examples:

(a) Mycorrhiza:

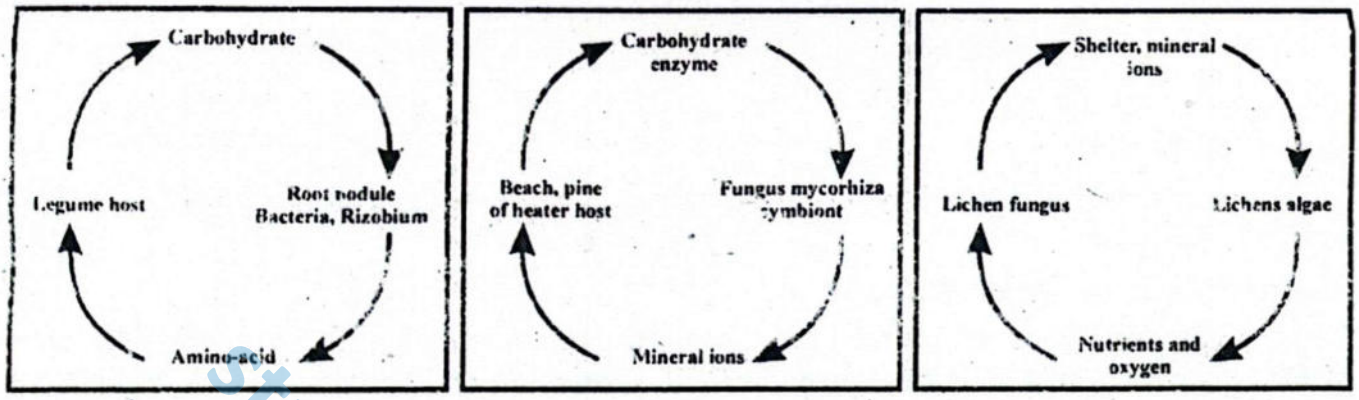
Is an association between roots of plants growing in acid soil and certain fungi. The host is pine, beech or heather and provides fungus with an enzyme to digest carbohydrate. In return fungus symbiont passes mineral ions from soil to host.

(b) Root Nodules:

The *leguminous* plants pea and beans are hosts to symbiotic bacteria which inhabit the roots forming root nodules. The root nodules bacteria fix nitrogen in soil air, converting it in amino acid, which the host uses. In return, host provides bacteria with food and protection.

(c) Lichen:

Lichens have symbiotic association with algae which lives in mycelium of fungus. The lichens grow on exposed rock surfaces and are important colonizers of bare ground.



(ii) Commensalism:

A symbiotic relationship that benefits one species and neither helps nor harms the other is called commensalism.

Example:

Sharks have small fish called remoras attached to them. As shark feeds, remoras pick up scraps. Remora has benefit of food but shark is not affected.

4. GRAZING:

The mode of feeding in which the animals eat grasses is called grazing. These animals are rabbits, goat sheep etc, which live in pastures.

Effect of grazing:

If the number of animals are increased in the pasture then their hooves can destroy the soil due to which the soil becomes hard and rain water cannot penetrate this soil. It runs off from the upper surface removing the top soil. At last the grazing turns the land barren.

However it also has positive effect on the ecosystem. Moderate grazing is very helpful maintain grassland. It destroys the competitors and helps the grass to grow well.

Q.6. What are biogeochemical cycles? Write a detail account of nitrogen cycle.

Ans. BIOGEOCHEMICAL CYCLES:

The cycle in which nutrients move from living to non living portions of ecosystem in cyclic manner is called biogeochemical cycle.

NITROGEN CYCLE:

The process by which limited amount of nitrogen is circulated and recalculated throughout world of living organisms is known as nitrogen cycle.

Explanation:

A large amount of nitrogen is present in the atmosphere thus it is its chief reservoir. In atmosphere nitrogen is present in elemental state which is not used by most of the living things. They therefore use the nitrogen of soil minerals which is in very small amount. This small amount of nitrogen in soil is major limiting factor for the growth of plants.

STEPS OF NITROGEN CYCLE:

There are three major steps in nitrogen cycle.

1. Ammonification
2. Nitrification
3. Assimilation

1. Ammonification:

Nitrogen in the soil is in the form of major complex organic compounds such as protein, amino acids, nucleic acids and nucleotides. These complex compounds are invaded by bacteria and fungi which decompose them in simple compounds. The micro organisms use proteins and amino acids and release excess of ammonia or ammonium ions $(NH_4)^+$. This process is known as ***ammonification***.

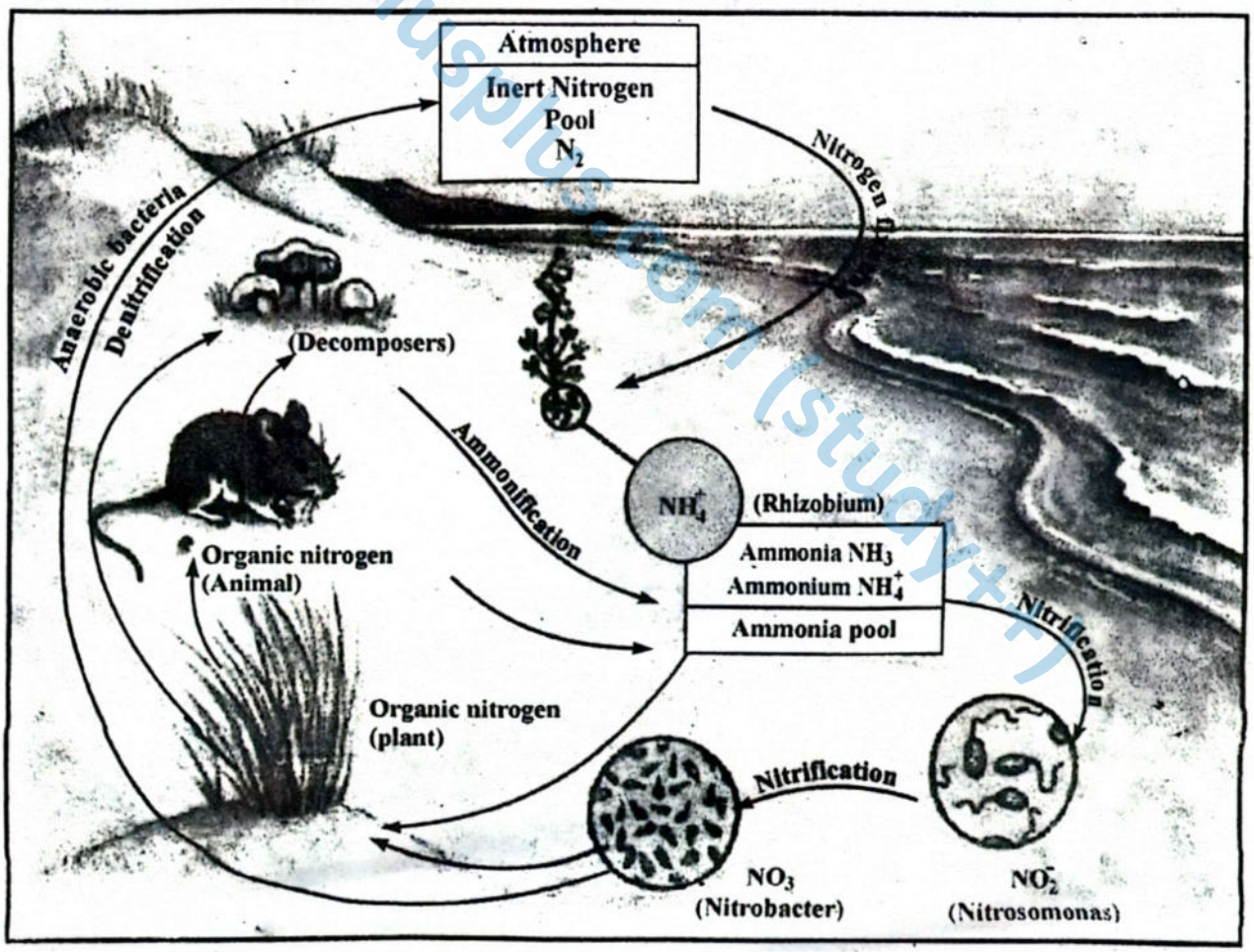


Fig. Nitrogen cycle

2. Nitrification:

This is the second step of the cycle in which the nitrifying bacteria of soil oxidize ammonia or ammonium ions and convert them into nitrates. This oxidation is known is nitrification.

3. Assimilation:

This is third process of nitrogen cycle. Plants can use direct ammonium ions or ammonia, nitrate is the form in which most nitrogen moves from soil into roots. As the nitrate reach the plant cells they are reduced back to ammonium. This is called assimilation process. This ammonium is transferred to amino acids and other nitrogenous organic compounds.

Nitrogen Depletion and its Remedies

Nitrogen Depletion

Nitrogen is lost in the atmosphere in different ways during.

(i) Soil erosion

(ii) Fire and water percolating down through soil.

(iii) Nitrogen is lost during the process of denitrification from the soil. As many bacteria break down nitrates they release nitrogen in the absence of oxygen.

Remedies

Nitrogen is balanced through:

(i) Nitrogen fixing bacteria which incorporate gaseous nitrogen from air into organic compound.

(ii) Nitrogen fertilizers added by the man increases the soil - nitrogen resources.

Q.7. How do the energy flow in a food chain of ecosystems?

Energy in the ecosystems enter through sun in the form of heat and light energy [illegible]ed and used is divided into gross primary production and net primary production.

Gross Primary Production:

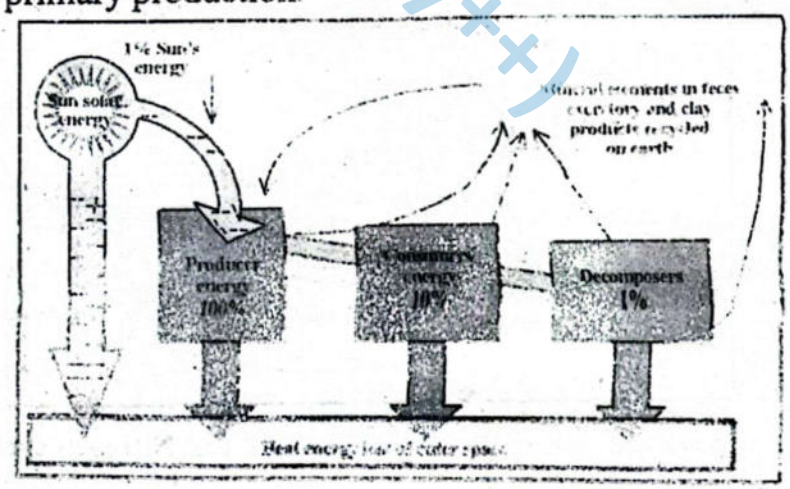
As plants use energy to complete the process of photosynthesis so total amount of energy fixed by plants is called gross primary production.

Net Primary Production:

The amount of energy left after plants have met their needs is net primary production which shows up as plant biomass.

Percentage of Energy used:

About 1% of the total energy from sun is trapped by producer in an ecosystem. The remaining 99% of solar energy is



used to evaporate water, heat up soil and then lost to the outer space. As energy is transformed from one trophic level to next from producer to primary consumer, between 80 to 90% of original energy is lost as heat a by product of respiration. However a continuous flux of energy can be constructed.

A short food chain of two or three links supports a community more efficiently then long chain of five links.

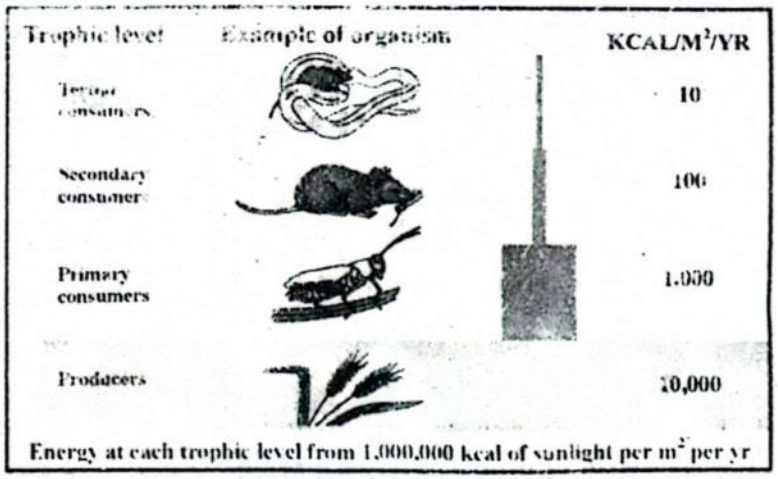


Fig. An energy pyramid

SOLVED EXERCISE

Q.1. Fill in the blank with appropriate words.

(i) A group of similar organisms living together in space and time is called _____.

(ii) Organisms which can synthesize their own food are called _____

(iii) Animals, non-green plants and micro organisms directly or indirectly green plants depend upon for their food so they are called _____.

Ans: **(i)** *population* **(ii)** producer **(iii)** consumers

Q.2. Write 'True' or 'False', as the case may be against the following statements. Correct the statement, if it is false.

(i) **At different places in an environment when you study only one population, it will be synecology.** **False**

True: At different places in an environment when you study only one population, it will be autecology.

(ii) **A biotic components include all living component.** **False**

True: Biotic components include all living component.

(iii) **Primary succession may start in a pond-called xerosere.** **False**

True: Primary succession may start in a pond-called hydrosere.

(iv) **The animal that is caught and eaten is the predator.** **False**

True: The animal that is caught and eaten is the prey.

(v) **Endoparasites live inside the body of the host.** **True**

Q.3. Four options are given against each question select the best answer.

(i) **The study of relationship of an organism to their environment is knows as:**

(a) biology (b) ecology
(c) zoology (d) mycology

(ii) **Similar goup of individuals who can inter breed and produce organisms of their ownkind forms a;**

(a) population (b) community
(c) species (d) succession

(iii) **When living and non-living interact to produce a stable system in which exchange of material with flow of energy takes place, it forms a/an**

(a) environment (b) ecosystem
(c) stable community (d) ecological succession
(e) all of these are correct.

(iv) **The living organism which can prepare their won food are:**

(a) predators (b) parasites
(c) producers (d) prey

(v) **The living organisms, which cannot prepare their won food but obtain ready-made food from others, are**

(a) primary and secondary consumers
(b) secondary and tertiary consumers
(c) only primary consumers
(d) consumers

Ans. **(i)** (b) **(ii)** (c) **(iii)** (b) **(iv)** (c) **(v)** (d)

Q.4. Short questions

(i) **What are the biochemical cycles?**

Ans. The nutrient cycle is called biogeochemical cycle in which nutrients move from living to non living to living portion of ecosystem in cyclic manner.

(ii) **Sketch three main steps in nitrogen cycle.**

Ans. Three main steps in nitrogen cycle are ammonification, nitrification, assimilation.

(iii) **Define grazing.**

Ans. *Many animals* feed on grass. This mode of feeding is called grazing.

(iv) **What percentage of sun energy reaches to plants?**

Ans. 1% of sun energy reaches to plants.

(v) ***What is autecology?***

Ans. When single population relationship is studied it is autecology.

(vi) **Define synecology.**

Ans. When different communities of the environment are studied it is synecology.

Q.5. Extension Questions.

(i) Define the environments? What must environment supply for insects, green plants, birds, animals and people?

Ans. The place where an organism live is called its environment. The environment must supply all the abiotic factors like water, soil, temperature, light etc.

(ii) **What factors in the environment can affect all living things? Are they important to survive in biome?**

Ans. Please see Q. No. 3

(iii) What can you conclude about all the physical and biological factors in an environment?

Ans. Please see Q. No. 3

(iv) What is biosphere? What must the biosphere provide for living things?

Ans. Please see Q. No. 2

(v) Define succession. Discuss succession on land.

Ans. Please see Q. No. 4