

## **Chapter 14**

### **Ecosystem**

#### **1 Marks Questions**

**1. Decomposition is faster if detritus is rich in nitrogen and water soluble substance like sugars. When is the decomposition process slower?**

**Ans.** Its slower if detritus is rich in lignin and chitin.

**2. If we count the number of insects on a tree and number of small birds depending on those insects as also the number of larger birds eating the smaller, what kind of pyramid of number would we get?**

**Ans.** Inverted Pyramid of Number .

**3. Differentiate between Sere and Seral communities.**

**Ans.** Sere :Entire sequence of communities that successively change in a given area.

Serial community :Individual transitional community .

**4. Who are generally the pioneer species in a Xerarch succession and in a Hyararch succession?**

**Ans.** Pioneer species in Hydrarch succession are usually the small phytoplanktons and that in Xerarch succession are usually lichens.

**5. Which metabolic process causes a reduction in the Gross Primary Productivity?**

**Ans.** Respiration.

**6. What percentage of photosynthetically active radiation is captured by plants?**

**Ans.** 2 – 10%

**7. Name the pioners of primary succession in water.**

**Ans.** Phytoplanktons

**8.Name any two man – made ecosystem?**

**Ans.** Aquarium & Garden.

**9.Define stratification?**

**Ans.** Stratification in an ecosystem refers to the vertical distribution of different species occupying different levels.

**10.Name the ecological pyramid that is always upright?**

**Ans.** Pyramid of energy.

**11.Name the trophic level occupied by secondary consumers & tertiary consumers?**

**Ans.** Third trophic level & fourth trophic level respectively

**12.Define standing crop?**

**Ans.** The amount of living matter or biomass present at every trophic level is known as standing crop.

**13.Name the ecological pyramid that is inverted in tree ecosystem?**

**Ans.** Pyramid of Number.

**15.What is 10% law?**

**Ans.** At each trophic level, 90% energy is degraded into heat & only 10% is transferred to next trophic level this rule is called 10% law.

**16.Mention one similarity between hydrach & Xerach secession?**

**Ans.**Both hydrach & xerach leads to establishment of similar mesic conditions.

**17.What is the approximate value of net primary productivity of biosphere?**

**Ans.**170 billion tons.

**18.Name two climatic factors that regulate decomposition?**

**Ans.** Chemical composition of detritus & climatic factors.

**19.What is sere?**

**Ans.** The entire sequence of communities that successively change in a given area resulting in climax community is called sere.

**20.Name the primary consumers in aquatic ecosystem?**

**Ans.** Zoo planktons.

**21.Name the pioneer species in the primary succession on rock?**

**Ans.** Lichens.

**2 Marks Questions**

**1. What is the shape of pyramid of biomass in sea? Why?**

**Ans.** Inverted, because biomass of fishes far exceeds that of phytoplankton.

**2. Give an example of an ecological pyramid which is always upright. Justify your Answer.**

**Ans.** Pyramid of energy is always upright and can never be inverted, because when energy flows from a trophic level to the next trophic level some energy is always lost as heat at each step.

**3. Differentiate between primary succession and secondary succession. Which one occurs faster?**

**Ans.** Primary Succession :A process that starts where no living organisms are there.  
Secondary succession : A process that starts in areas which have lost all the living organisms that existed there.

**4. Gaseous nutrient cycle and sedimentary nutrient cycles have their reservoir . Name them. Why is a reservoir necessary?**

**Ans.** Reservoir for Gaseous nutrient cycle : Atmosphere; for sedimentary nutrient cycle : Earth's crust. Reservoir is needed to meet with the deficit which occurs due to imbalance in the rate of influx and efflux.

**7. Differentiate between Hydrarch and a Xerarch succession.**

**Ans.** Hydrarch Succession :Starts in water proceeds from hydric (aquatic) to mesic (neither dry nor wet) situations. Xerarch succession :Starts on barren rock Proceeds from Xeric (dry) conditons.

**8. What is the effect on decomposition rate if :-**

**a) Detritus is rich in lignin and chitin**

**b) Detritus is rich in nitrogen and sugars**

**Ans. a)** Decomposition rate is slower

**b)** Decomposition rate is faster.

**9. What are the limitations of ecological pyramids?**

**Ans. (i)** Does not take into account same species belonging to two or more trophic levels.

**(ii)** Assumes simple food chain, does not accommodate food web.

**(iii)** Saprophytes have not been given any place in ecological pyramids.

**10. Name any four ecosystem services. Who gave the price tags on nature's life support services? Which is the most important ecosystem service provider?**

**Ans.**

- Forest (ecosystem) purify water and air
- Mitigate Droughts and floods
- Nutrient cycling
- Generate fertile soil
- Provide habitat for wildlife
- Pollinate flower
- Maintain Biodiversity
- Provide aesthetic, cultural & spiritual values
- Robert Constanza gave price tags to ecosystem services.
- Most important ecosystem services provider : Soil formation.

**13. Why is secondary succession faster than primary succession?**

**Ans.** Secondary succession refers to community development on sites previously occupied by well developed communities where the environment is both organic & inorganic. Since these bare areas possess suitable soil for proper growth so, secondary succession is more rapid than primary succession.

**14. Distinguish between upright & inverted pyramids?**

**Ans.** In upright pyramid the number of producers or its biomass is maximum in an ecosystem & it decreases progressively at each trophic level. Whereas in inverted pyramid at producer level is minimum & is increasing progressively at each trophic level in a food chain.

**15. Explain with an example, why is the length of a food chain in an ecosystem generally limited to 3-4 trophic level?**

**Ans.** In a food chain at each trophic level about 90% of energy is degraded into heat & only 10% energy is transferred to next trophic level thus of trophic levels in the food chain the amount of energy to be transferred to next trophic level will be approximately negligible thus a food chain is generally limited to 3-4 trophic levels.

**17. What is meant by ecological pyramid? With the help of one example each, show that pyramid of number can be both upright as well as inverted.**

**Ans.** The graphic representation of the trophic structure of a food chain is known as ecological pyramid. The ecological pyramid of number represents the numerical

representation between different trophic both upright or inverted.

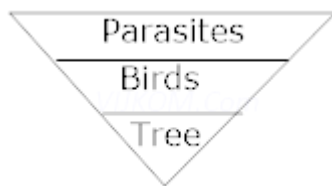
In upright pyramid of numbers, the more abundant species form the first trophic level & forms the base of pyramid & less abundant species remains near the top e.g. Grass land ecosystem.

Green plants →→ Rabbit →→fox→→Lion



In inverted pyramid of number, the most abundant species occurs at the top while the less abundant species forms the base eg. Tree ecosystem

Tree →→Birds →→Parasite



### 18. Describe the components of an ecosystem?

**Ans.** Ecosystem is a functional unit of nature consisting of biotic & abiotic factors where the living organisms interact among themselves & with physical environment.

Ecosystem consists of two components:-

i) ABIOTIC COMPONENTS :- e.g.

a) Inorganic substances phosphorus, sulphur, carbon, nitrogen hydrogen etc.

b) Organic substances e.g. carbohydrates, proteins, lipids.

c) Climatic regime e.g. light, humidity, rainfall, temperature.

ii) BIOTIC COMPONENTS:

a) Producers :- The organisms which produce food for themselves & for all living organism from inorganic raw material with the solar radiation are called producers.

b) Consumers :- Those living heterotrophic members of ecosystem which consume the food synthesized by producers. They are broadly classified as.

i) Primary consumers:- They are directly dependent on producers called herbivores e.g. rat, deer, cow, goat.

ii) Secondary consumers:- The organism that use primary consumers as their food are called carnivores e.g. fox cats, lions.

iii) Tertiary consumers:- These are top carnivores which prey upon other carnivores, & herbivores e.g. crow, man.

c) Decomposers :- Organism that break up the dead bodies of plants animals & the related waste products are called decomposers e.g. bacteria, Fungi etc.

### 19. "Energy flow in an ecosystem is always unidirectional justify the statement.

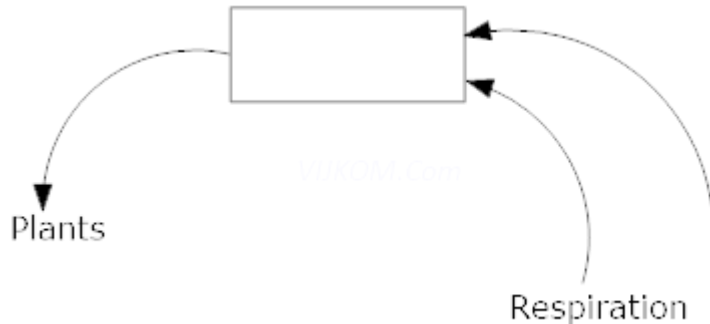
**Ans.** Energy flow in an ecosystem is always unidirectional means that energy is always transferred from one trophic level to next trophic level & is not reverted back – e.g. energy from sun is captured by producers which are then eaten by primary consumer & energy is transferred to next trophic level.

### 20. Differentiate between Production & decomposition?

**Ans.** Production refers to the process of synthesis of organic food materials from

inorganic substances such as  $\text{CO}_2$   $\text{H}_2\text{O}$  in the presence of sunlight whereas decomposition is a process of break down of complex substances into its constituents & it is brought about by bacteria, fungi etc.

**21.Explain why pyramid of energy of an ecosystem is always uprights never inverted?**



**Ans.** The pyramid of energy represents total amount of energy utilized by different trophic level organism in unit area. At each level, total energy available is relatively more than at higher trophic level because of loss of energy from one trophic level to other thus, pyramid of energy is always straight.

**23.What do you mean by “productivity of an ecosystem? What are the types of productivity also mention the factors on which productivity of an ecosystem depends?**

**Ans.** Productivity of an ecosystem is the rate at which solar radiations energy is fixed by vegetation of an ecosystem per unit area & per unit time. It is general expressed in terms of unit of energy (cal)produced in a unit area ( $\text{m}^2$ ) per unit time (year).

Productivity can be of two types:-

1) Primary Productivity:- It is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis primary productivity can further be of two types:-

a) Gross primary productivity :- It refers to the total amount of food formed lay producers.

b) Net primary productivity:- It refers to gross production minus loss lay respiration & decomposition  $\text{NPP} = \text{GPP} - \text{respiration loss}$

2) Secondary Productivity :- The rate of storage at consumer level is secondary productivity. It is the rate of re synthesis of organic food by consumers primary productivity depends on:-

i) a number of environmental factors

ii) availability of nutrients.

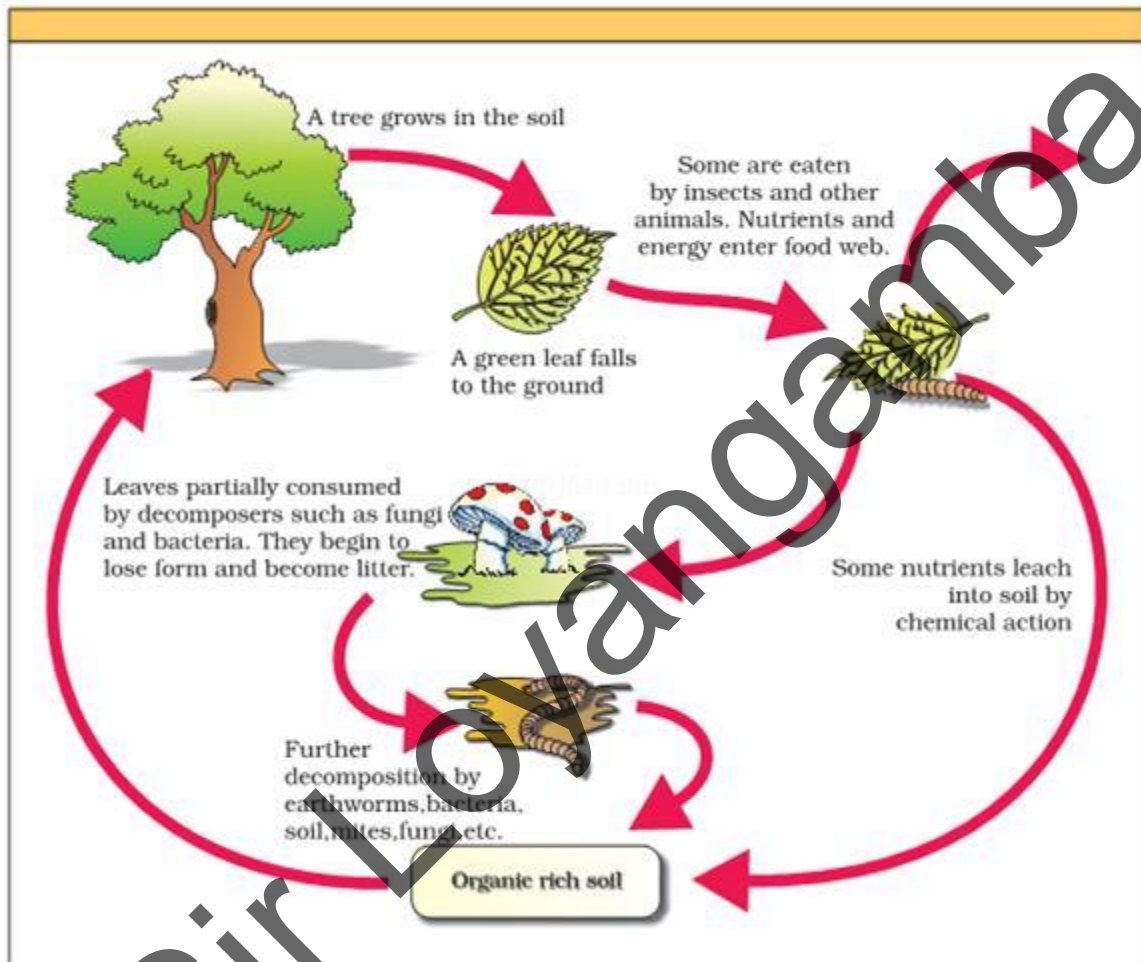
iii) photosynthetic capacity of plants.

**24.What is decomposition – Describe the different processes involved in decomposition?**

**Ans.** Decomposers e.g. bacteria, fungi etc. helps in breakdown of complex organic matter into inorganic substances like  $\text{CO}_2$ , water minerals & this process is called decomposition. Dead plant remains e.g. leaves, bark flowers & dead remain of animals including faecal matter constitute detritus. The important processes involved in decomposition or :-

i) Fragmentation :-Detritivores breaks down detritus into smaller particles.

- ii) Leaching :- Water soluble inorganic nutrients go down into soil horizon & get precipitated as unavailable salts lay process of leaching.
- iii) Catabolism:- The enzymes of bacteria & fungi degrade detritus into simple inorganic substances
- iv) Humification :-Humification leads to accumulation of a dark colored amorphous substance called humus that is highly resistant to microbial action & undergoes decomposition at extremely slower rate.
- v) Mineralisation :- The humus is further degraded by some microbes & release of inorganic nutrients occurs by the process of mineralization.



## 27. Differentiate between primary productivity & secondary productivity?

**Ans.** Primary productivity refers to productivity at trophic level i.e. food energy formed by way of photosynthesis using solar energy whereas secondary productivity refers to gross productivity minus losses by way of respiration & decomposition.

## 31. Mention some of the ecological services provided by forests?

- Ans.**
- i) Forests purify air
  - ii) They mitigate droughts & floods.
  - iii) They help in cycling of nutrients.
  - iv) They provide habitat to number of wild life
  - v) They maintain biodiversity.

### 32. Differentiate between food chain & food web?

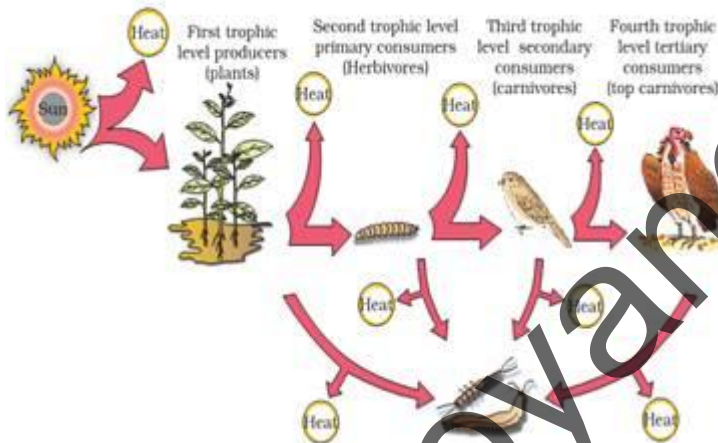
**Ans.** The unidirectional sequence of organisms in which energy flows in the form of food from one organism to another through the process of eating & being eaten is called food chain whereas the network of interlinked food chains are collectively known as food web.

### 3 Marks Questions

#### 1. With the help of a diagram, represent the energy flow through different trophic level.

**Ans.** In an ecosystem, energy flows through different trophic level by food chain. It consists of two steps:-

i) Trapping solar energy:- Primary source of energy is sun only 48% of sun's energy reaches the surface of earth & only a part of it is used by plants for photosynthesis. The chemical energy produced by plants is stored in plant tissues. The photosynthetic organism uses a part of this chemical energy & transfer it to organism at next trophic level.



ii) Path & flow of energy:- The primary consumers therefore take chemical potential energy in the form of food. Most of it dissipates as heat during respiration & is lost out of ecosystem. The same process is repeated at secondary consumers, at each trophic level 90% energy is degraded into heat & only 10% is then transferred to next trophic level this rule of energy flow is called ten percent law.

### 5 Marks Questions

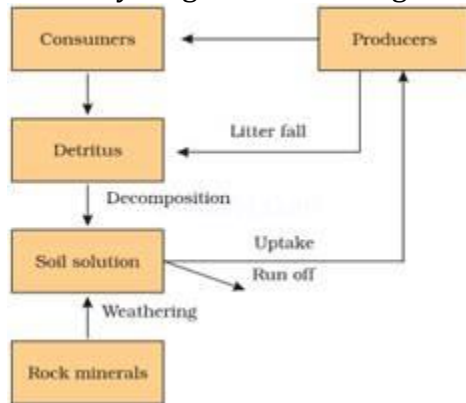
#### 1. Represent schematically & describe the phosphorus cycle in an ecosystem?

**Ans.** The major reservoir of phosphorus is sedimentary rocks which are only available to basic cycle in small amounts as a result of weathering. These phosphorus are weathered & later transported to the soil by wind & water, where they exist as inorganic dissolved phosphates.

The basic phosphorus cycle begins with dissolved phosphates which are absorbed by plants for making their own tissue plants are eaten by animals. Decay bacteria breakdown the tissue of dead animals down these product & return phosphate to soil. The water - soluble phosphates is lost to the deep rudiments of the ocean through run-off. The major pathway of returning phosphorus to land is uplifting of marine sediments. Some amount of phosphorus is returned to absorb inorganic phosphate, when they die, most of absorbed phosphate is recycled back into ambient mater. This

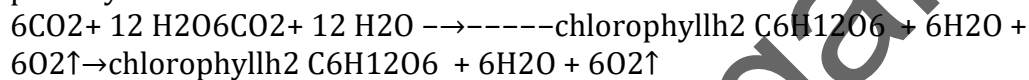


sort of cycling is called biological cycle or metabolic cycle.



## 2. Represent schematically & describe carbon cycle in ecosystem?

**Ans.** The source of carbon is atmosphere & water. Carbon is present in atmosphere mainly in the form of  $\text{CO}_2$ . It is vital to the production of carbohydrates through photosynthesis.



In atmosphere, carbon is present in the form of  $\text{CO}_2$  from the atmosphere it is incorporated into tissues of green plants e.g. carbohydrates, proteins & lipids.

The  $\text{CO}_2$  dissolved in sea water is utilized by marine animals like protozoans, corals, mollusks etc for their life. In these animals,  $\text{CO}_2$  is converted into calcium carbonate which is used for construction of shell.



After death of marine animals,  $\text{CaCO}_3$  stored in shells is either deposited as sedimentary rock or dissolved in water to release  $\text{CO}_2$ . A certain proportion of carbon is deposited as coal. Carbon from coal returns to air in the form of  $\text{CO}_2$  through combustion & weathering thus, carbon from atmospheric pool moves to green plants, then to animals & finally to bacteria fungi etc. to return it to atmosphere through decomposition-