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ECOLOGY

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&

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**Sample Preview
of the
Solved
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Papers**

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QUESTION PAPER

(June – 2019)

(Solved)

ECOLOGY

Time: 2 Hours]

[Maximum Marks: 50

Note: Question no. 1 is compulsory. Attempt questions from all sections.

SECTION-A

Q. 1. (a) Fill in the blanks with the appropriate words given in the parentheses :

(i) Study of the ecology of groups or communities in relation to their environment is called _____.

(Autecology/Synecology)

(ii) The _____ zone includes areas too deep to be penetrated by light usefull for photosynthesis.

(profundal/limnetic)

(iii) Shade loving plants are called _____.

(heliophytes/sciophytes)

(iv) _____ grow in moist habitat and well aerated soils.

(Xerophytes/Mesophytes)

(v) _____ is defined as the process by which water changes from vapour phase to liquid state.

(Condensations/Sublimation)

Ans. (i) Synecology, (ii) Profundal, (iii) Sciophytes, (iv) Mesophytes, (v) Condensation.

(b) State whether the following statements are true or false:

(i) The processes involved in the formation of soil are rapid and discontinuous.

(ii) Plants absorb water from the soil and this reduces quantity of moisture in the soil

(iii) Exdponentially growing animal populations can overshoot the carrying capacity of their habitat.

(iv) Dodo was the first animal species whose extermination is not fully documented.

(v) IUCN has established two categories of threatened species.

(vi) Traces of ozone (O₃) in the air are harmful to plants, animal and human beings.

Ans. (i) False, (ii) True, (iii) True, (iv) False, (v) False, (vi) True.

(c) Define the following terms:

(i) Habitat Ecology

Ans. Ref.: See Chapter-1, Page No. 5, 'Habitat Ecology'.

(ii) Transpiration

Ans. Transpiration is the process in which water is evaporated in the atmosphere from plant leaves and other parts. Some amount of water is consumed by roots and rest is evaporated in the atmosphere.

Q. 2. (a) Describe the ecological adaptations in animals to aquatic environment.

Ans. Ref.: See Chapter-3, Page No. 23, Q. No. 12.

(b) Discuss the process of soil formation.

Ans. Ref.: See Chapter-4, Page No. 25, 'Introduction'.

Q. 3. (a) Explain the concept of tolerance range and limiting factors.

Ans. Species have tolerance ranges for the abiotic environmental conditions such as temperature, atmospheric pressure etc. In other words, they can tolerate (or survive within) a certain range of a particular factor, but cannot survive if there is too much or too little of the factor. For example, temperature, Polar bears survive very well in low temperatures, but would die from overheating in the tropics. On the other hand, a giraffe does very well in the heat of the African savanna, but would quickly freeze to death in the Arctic. Different types of organisms have different tolerance ranges for the same factor.

In ecology, common limiting factor resources are environmental conditions that limit the growth, abundance or distribution of an organism or a population of organisms in an ecosystem. The concept of limiting factors is based on Liebig's Law of the Minimum, which states that growth is controlled not by the total amount of resources available, but by the scarcest resource. Limiting factors may be physical or biological. Limiting factors are not limited to the condition of the species. Some factors may be increased or reduced based on circumstances. An example of a limiting factor is sunlight in the rain forest, where growth is limited to all plants on the forest floor unless more light becomes available. This decreases a number of potential factors that could influence a biological process, but only one is in effect at any one place and time.

(b) Describe the various types of food chains by giving suitable examples.

Ans. Ref.: See Chapter-5, Page No. 36, Q. No. 3, Page No. 37, Q. No. 6.

Q. 4. What is biogeochemical cycle? Explain its importance. Explain nitrogen cycle in nature.

Ans. Biogeochemical cycles are any of the natural pathways by which essential elements of living matter are circulated. The term biogeochemical is a contraction that refers to the consideration of the biological, geological and chemical aspects of each cycle. Elements within biogeochemical cycles flow in various forms from the non-living (abiotic) components of the biosphere to the living (biotic) components and back. In order for the living components of a major ecosystem (e.g., a lake or a forest) to survive, all the chemical elements that make up living cells must be recycled continuously. Each biogeochemical cycle can be considered as having a reservoir (nutrient) pool a larger, slow-moving, usually abiotic portion and an exchange (cycling) pool a smaller but more-active portion concerned with the rapid exchange between the biotic and abiotic aspects of an ecosystem. Biogeochemical gaseous cycles include those of nitrogen, oxygen, carbon and water cycle.

The nitrogen cycle is a complex biogeochemical cycle in which nitrogen is converted from its inert atmospheric molecular form (N_2) into a form that is

useful in biological processes. The nitrogen cycle contains several stages—

1. Nitrogen fixation: Atmospheric nitrogen occurs primarily in an inert form (N_2) that few organisms can use; therefore it must be converted to an organic or fixed form *i.e.*, ammonia in a process called nitrogen fixation. Most atmospheric nitrogen is 'fixed' through biological processes.

2. Nitrification: While ammonia can be used by some plants, most of the nitrogen taken up by plants is converted by bacteria from ammonia – which is highly toxic to many organisms into nitrite (NO_2^-) and then into nitrate (NO_3^-). This process is called nitrification and these bacteria are known as nitrifying bacteria.

3. Assimilation: Nitrogen compounds in various forms, such as nitrate, nitrite, ammonia and ammonium are taken up from soils by plants which are then used in the formation of plant and animal proteins.

4. Ammonification: When plants and animals die, or when animals emit wastes, the nitrogen in the organic matter re-enters the soil where it is broken down by other microorganisms, known as decomposers. This decomposition produces ammonia which is then available for other biological processes.

5. Denitrification: Nitrogen makes its way back into the atmosphere through a process called denitrification, in which nitrate is converted back to gaseous nitrogen. Denitrification occurs primarily in wet soils where the water makes it difficult for microorganisms to get oxygen. Under these conditions, certain organisms known as denitrifying bacteria will process nitrate to gain oxygen, leaving free nitrogen gas as a byproduct.

Q. 5. (a) What is Succession? Describe the various processes involved in succession.

Ans. Change is a permanent phenomenon of nature. It brings about the constant renovation of an existing community and results in the formation of new living conditions. It also helps in attaining a relatively stable or climax community. This process of constant change is known as succession.

Also Add : See Chapter-10, Page No. 70, Q. No. 1, 'Trends in Succession'.

Sample Preview of The Chapter

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ECOLOGY

ENVIRONMENT AND ITS COMPONENTS

Ecology and Ecosystem



INTRODUCTION

The concept of ecology and ecosystem is as old as the human civilization itself. The word ecology was coined by **Hanns Reiter** in 1968. Its origin relates to two Greek words “*Oikos*” meaning home or estate and “*logos*” meaning study. The word ecology is best defined by an American ecologist, **E.P. Odum** (1971) as the study of structure and function of nature.

The earlier divisions of ecology were plant and animal ecology but modern ecologists classify it into three subdivisions viz. “*Autecology*” which means the study of the ecology of an individual in relation to the environment, “*Synecology*” which means the study of the ecology of groups or communities in relation to their environment and “*Habitat ecology*” which means the study of both organism and the environment in which it lives. The environment is defined as the collection of living and non-living factors, events and their impact which surrounds and affects an individual. The environment is broadly classified into two components namely, biotic (living) and abiotic (non-living). Both these components keep on changing continuously and the

changes acceptable to the organisms (within a range) are called “*range of tolerance*”.

Every organism has two types of environments surrounding it. These are *external environment* consisting of biotic and abiotic components and envelopes an individual externally and the *internal environment* which is surrounded by external body surface which serves as a wall between external and internal environments.

Apart from natural environment, we also have *artificial environment* i.e. man-made environment like cultivated fields or cities, where the dependence on natural environment is reduced and is according to the needs of the population living in it. The term population is technically defined as a group of freely inter-breeding individuals of the same species present in a specific area at a given time. When speaking of human population in a specific area, other living organisms will not be included as they are population of different species.

The two basic types of attributes of a population are the numerical attributes such as density, death rate, dispersal and the structural attributes such as age distribution, growth form and dispersion. In nature the sum total of populations of different species (plants and/or animals) living together in an

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area with mutual tolerance and beneficial interactions amongst themselves and with their environment form a community. It can also be said that community is a localized group of several populations of different species living mutually in an environment and forming major and minor communities. A major community is mainly dependent on solar energy and functions quite independent of adjacent communities. Such communities are big in size and have a well defined structure. On the other hand, the minor communities which are also known as societies are considerably dependent on adjacent communities and cannot completely function independently in terms of energy and nutritional requirements. The organization of communities of organisms is properly ordered inspite of its complex structure and this organization from where the living population regulates their flow of energy is called 'Ecosystem' or 'Ecological' system.

The components of ecosystem are biotic and abiotic in nature. The biotic components comprise of producers and consumers. The producers can synthesize their own food with the help of sunlight (exampler plants) whereas the consumers are unable to produce their own food and draw their nutrition from green plants and animals (Example: cow, rabbit.)

The consumers are of further two types:

(a) Micro consumers which extract their nutrition from dead organic matter, example fungi.

(b) Macro consumers which feed on living plants and animals, example: goat, lion. They are further classified into:

- (i) Primary consumers which consume mainly plants, example rabbit.
- (ii) Secondary consumers which feed on primary consumers, example snakes; and
- (iii) Tertiary consumer which fed on secondary consumers, example: eagle.

The abiotic components comprise of energy, materials, climatic factors and edaphic factors. Basically there are two types of ecosystems that is 'terrestrial' which includes various types of

landscapes and 'aquatic' which includes mangroves, marshes and various water bodies. The terrestrial and aquatic ecosystems are mainly included in natural ecosystems, whereas a modified ecosystem like urban centers and industrial estates form a part of artificial ecosystems. The natural ecosystem also possesses of a unique feature to accommodate itself to minor atmospheric changes called 'homeostasis.'

The part of the earth where the life prevails is known as biosphere which consists of atmosphere, hydrosphere and the lithosphere. Thus the biosphere contains all living organisms, their environment and also governs the regulation of energy from the sun. However this makes it clear that the biosphere would be absent at zones which do not support life. Examples are the North and South poles, highest mountains and deepest oceans. This also gives a clue that living organisms are not equally present throughout the biosphere.

TERMINAL QUESTIONS

Q. 1. State the difference between natural and artificial ecosystems and give examples.

Ans. The natural ecosystem includes the terrestrial and aquatic ecosystems which mainly depend on the sun for flow and regulation of energy. The artificial ecosystem is a man made ecosystem, which to a large extent is free or independent in functioning. For example grassland is a natural ecosystem while a city is an artificial ecosystem.

Q. 2. State the difference between micro-consumers and macro-consumers.

Ans. The macro-consumers draw their nutrition from living sources. They are further classified as:

- (a) Primary consumer which consume only plants, like deer.
- (b) Secondary consumers which depend on the primary consumers for nutrition, like wolves.
- (c) Tertiary consumers which feed on secondary consumers like man.

The micro-consumers mainly draw their nutrition from the dead organic matter, like fungi.

Q. 3. Describe the contributions of ancient Greek philosophers in development of ecology.

Ans. Much like the Indian philosopher, the Greek philosophers were also well aware of the significance of environmental and ecological studies. Hippocrates emphasized the requirement of environmental studies for medical students in their curriculum. In his work on air, water and places, he referred to the effect of land, water and living area on health of humans.

Aristotle classified animals depending on their habitate and habits. Theophrastus was the first person to study ecological approach and his work was mainly on plant types and forms in relation to altitude, moisture and light exposure.

Q. 5. Outline the divisions of ecology.

Ans.

Q. 4. State the various definitions of ecology given by

(a) Ernst Haeckel

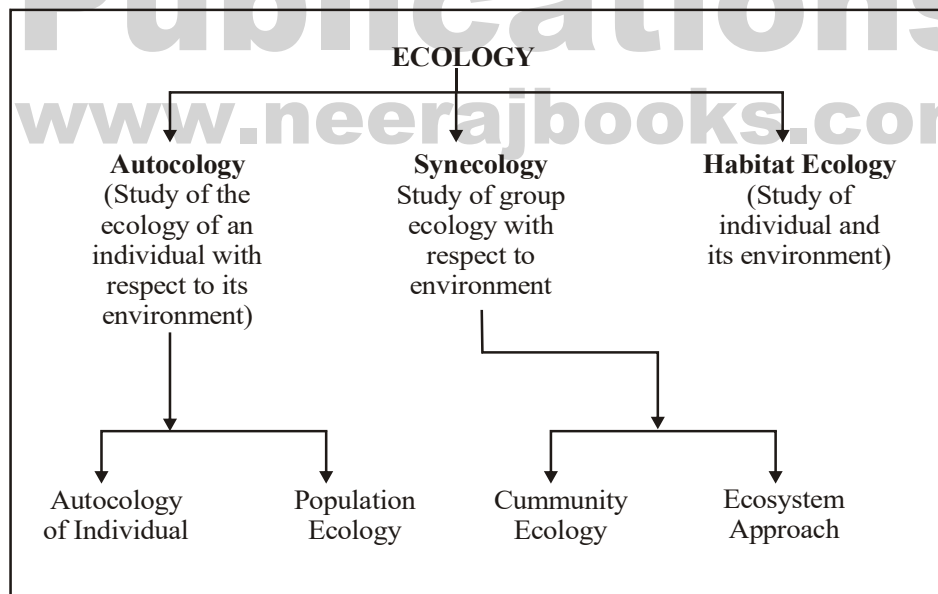
(b) Charles Elton

(c) EP Odeum

Ans. (a) Ernst Haeckel: The body of knowledge concerning the economy of nature. It is also the investigation of relation of animals with its organic and inorganic environment, including its friendly and inimical relations with those animals and plants which directly or indirectly come in to its contact. In other words it is the study of all complex inter-relations referred to by Darwin as the conditions of struggle for existence.

(b) Charles Elton: Ecology is scientific natural history.

(c) E.P. Odum: Ecology is study of structure and functions of nature.



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Q. 6. What do you understand by the dominant species?

Ans. In a community the species that have a large number or weight have an impact on the growth of other members of the community, as they modify the living area as per their need. Such species are called as dominant species.

Q. 7. What do you understand by species diversity?

Ans. The number of species and their abundance in a community is directly related to each other. Greater the number of species in a community, more will be the species diversity. It thus refers to the array of different species present in a community.

Q. 8. What do you understand by relative abundance?

Ans. The relative proportion of different species occurring in a community is called relative abundance.

SELF-ASSESSMENT QUESTIONS

Q. 1. Describe the ecological awareness contained in 'Charak Samhita' and 'Sushrut Samhita'.

Ans. The age old Indian scientific epics like *Charak* and *Sushrut Samhita* give a detailed account of the basic nature of soil, land conditions, weather and living conditions of the population. They also provide elaborate classification of plants and animals on the basis of factors stated above. The significance of land, air and water in regulating life is clearly mentioned in *Charak* and *Sushrut Samhitas*. These medicinal literatures also specify that the polluted air and water are injurious to health. This shows that people during this era had a good awareness of plant and animal ecology and the ecological principles. These books also contain the detailed description of local plants, their ecology and the relationship with the ecosystem.

Q. 2. Define environment and explain the difference between internal and external environments.

Ans. The environment is defined as a collection of living and non-living factors, events and their impact which surrounds an individual. The external elements like climate, temperature, *etc* constitute to form the external environment. All the living organisms also possess an internal environment which is surrounded by the outer body surface. This external body acts as a barrier between the internal and external environments. The internal environment is comparatively more stable as compared to external environment, but is not absolutely constant.

OTHER IMPORTANT QUESTIONS

Q. 1. When did the concept of ecological studies started in india?

Ans. In India, the concept of ecological studies started at the end of the nineteenth century. In this period the descriptive accounts of the forests were prepared by various forest officers. But, the first comprehensive ecological contribution was made in 1921 by **Prof. P. Dudgeon** of Allahabad University, who described the role of environment in the succession of communities.

Q. 2. What are the various mutual relationships among the individuals of a community.

Ans. In a community these exist one or several relationship include all the direct and indirect effects that organisms have upon each other. There are mainly three mutual relationship existing in a community:

1. Competition: It occurs when there is demand for common resources by different organisms. It is of two types:

(a) **Interspecific:** Competition between individual of different species.

(b) **Intraspecific:** Competition among the individuals of same species

2. Stratification: In this different plants and animals in a community develop a pattern of stratification and hence plants and animals of each layer differ in size, behaviour and adaptation from other layers.