

Chapter # 3

"Biodiversity"

Understanding the concept

Q#1

Relate the importance of biodiversity with natural ecosystem through examples?

Ans:-

Biodiversity is a measure of the variety of organisms present in different ecosystems.

The term 'biodiversity' has been derived from bio and diversity. Formerly it was called 'natural diversity'. 'Diversity' means variety within a species and among species.

Importance of biodiversity and natural ecosystem.

Plants and animals (flora and fauna) diversity depends on climate, altitude, soils and the presence of other species. Biodiversity is not distributed evenly on Earth. It is richer in the tropics while there are fewer species in the polar regions. In the year 2006 large number of the Earth's species were classified as endangered or threatened species.

Examples:-

i. Most of the hotspots are located in the tropics and most of their established species, are forests.

For example. Brazil's Atlantic Forest contains roughly 20,000 plant species, 1350 vertebrate species, and millions of insect species about half of which occur nowhere else in the world.

ii. Biodiversity found on Earth today is the result of 4 billion years of evolution. The origin of life is not well known to science, though limited evidence suggests that until 600 million year ago, all life consisted of bacteria and similar single-celled organisms.

iii. A wide range of industrial materials e.g. building material, fibres, dyes, resins, gums, adhesives, rubber and oil are derived directly from biological resources.

iv. Biodiversity provides food for humans. A significant proportion of drugs are derived, directly or indirectly, from biological sources.

v. Biodiversity plays important role in making and maintaining ecosystems.

vii It plays a part in regulating the chemistry of our atmosphere and water supply.

viii Biodiversity is directly involved in recycling nutrients and providing fertile soil.

Q # 2

Explain the aims and principles of classification, keeping in view its historical background?

Ans:

Biological classification is a method by which biologists group and categorize species of organisms.

Aims of classification

Taxonomy:

The branch of biology which deals with classification is called taxonomy.

Systematic:

The branch which deals with classification and also traces the evolutionary history of organisms is known as systematics. The main aims of both these branches are:

i: To determine similarities and differences among

organisms so that they can be studied easily.

iii: To find the evolutionary relationships among organisms.

Principles of classification/Basis of classification

i. Classification is based on relationship amongst organisms and such relationship is got through similarity in form or structure.

ii: These similarities suggest that all organisms are related to one another some point in their evolutionary histories. However, some organisms are more closely related than other. For example, sparrows are more closely related to pigeons than to the insects. It means that the former two have common evolutionary histories.

iii: Biologists have classified all the known organisms into group and subgroups on the basis of similarities. These similarities are seen in structures, biochemistry, cytology and genetics.

iv: Modern genetics has provided another type of information to taxonomists. The genetic differences

between two studied organisms can be determined and can be used forgetting idea about similarities and differences in their structures and functions.

~ ~ ~ Q No 3 ~ ~ ~

Explain the base for establishing five kingdoms of living organisms?

Ans:

In 1867, Robert Whittaker introduced the five-kingdom classification system. This system is based on:

- i: The levels of cellular organization i.e. prokaryotic, unicellular eukaryotic and multicellular eukaryotic.
- ii: The principal modes of nutrition i.e. photosynthesis, absorption and ingestion. On the basis, organisms are classified into five Kingdoms: monera, protista, fungi, plantae and animalia.

~ ~ ~ Q no 3 (A) ~ ~ ~

Describe the general characteristics of the five kingdom?

Ans:

In 1937, E-Chatton suggested the terms of "procariotique" to describe bacteria into "Eucariotique" to describe

animal and plant cells. In 1967, Robert Whittaker introduced the five-kingdom classification system.

This system is based on:

- i. The levels of cellular organization i.e. prokaryotic, unicellular eukaryotic and multicellular eukaryotic.
- ii. The principal modes of nutrition i.e. photosynthesis, absorption and ingestion. On the basis of organisms are classified into five kingdoms: monera, protista, fungi, plantae and animalia.

Modification in the five-kingdom classification:

In 1988, Lynn Margulis and Karlene Schwartz modified the five-kingdom classification of Whittaker by considering cellular organization, mode of nutrition, cytology, genetics and organelles of symbiotic origin (mitochondria and chloroplast). They classified the organisms into the same five kingdoms as proposed by Whittaker.

Q No 5

Justify why viruses are excluded from the five-kingdoms classification system.

Ans:

Status of Viruses:

Viruses are acellular i.e. they do not possess cellular organization yet show some characters of living. Viruses are infectious entities which contain either RNA or DNA, normally encased in protein coat and reproduce only in living cells, where they cause a number of diseases. They are not considered as organisms and thus are not included in the five-kingdom classification system. Prions and viroids are also acellular particles and are not included in the five-kingdom classification system.

Q No 5

Describe the aims and principles of binomial nomenclature?

Ans:

Binomial nomenclature:

Binomial nomenclature is the

method of giving scientific names to living organisms. As the word 'binomial' suggests, the scientific name of a species consists of the two names: the first is the genus name and the second one is the name of the species. Swedish biologist Carolus Linnaeus (1707-1776) first introduced and adopted the system of binomial nomenclature.

Properties of binomial nomenclature.

- i: Scientific names are usually printed in italics, such as *Homo sapiens*. When handwritten they are underlined.
- ii: The first term (generic name) always begins with capital letter, while the species name is never capitalized (even when derived from a proper name).
- iii: In scientific journals, the main entry for the scientific name is followed by the surname of the scientist who first published the classification. For example: *Passer domesticus*.
- iv: When used with a common name, the scientific name usually follows in parenthesis. For example:

"The house sparrow (*Passer Domesticus*) decreasing in Pakistan."

v: The scientific name is generally written in full when it is first used. But when several species from the same genus are being listed, it may then be abbreviated by just using an initial for the genus:

For example: *Canis lupus* becomes *C. lupus*.

vi: The abbreviation "et" is used when the identification is not confirmed. For example *Corvus et. splendens* indicates a bird similar to the House Crow but not certainly identified as a species.

viii: The genus name and specific name may come from any source what so ever. Often they are Latin words, but they may also come from Ancient Greek, from a place, from a person (preferably a naturalist).

Aims of binomial nomenclature.

The value of this system is due to its widespread use and the stability of its names. In binomial nomenclature, every species can be unambiguously identified with just two words. The same name can be used all over the world, in

all languages. avoiding difficulties of translation.

Q No 6

Explain the impact of human beings on biodiversity?

Ans

Impact of human beings on biodiversity:

To improve the living conditions for 600 million humans, we are imposing serious threats to the survival of much biodiversity.

i. Habitat loss and deforestation:

Habitat loss and deforestation (cutting down of trees) are important causes of species extinctions. As deforestation passed in tropical forests, it becomes the main cause of the mass extinction of species. All species have specific food and habitat needs.

Importance of tropical forest:

Tropical forests are important because they harbour at least 50 percent of the world's biodiversity. Direct observation prove that these forests are declining. The original extent of tropical

rain forests was 15 million square km. Now there remains about 7.5-8 million square km, so half is gone.

The closed canopy forest in the north west Frontier Province NWFP (KPK) of Pakistan is reported to be shrinking at approximately 1% per year. More significant is the persistent spread of farmers into the forests: the killing of trees through lopping, burning and tapping; the development of small agriculture plots among the trees; and excessive grazing by domestic animals.

iii- Over-hunting

Over hunting has been a significant cause of the extinction of hundreds of species and the endangerment of many more, such as whales, ibex, urial, markhor (the national animal of Pakistan) etc. Commercial hunting, both legal and illegal, is the principal threat.

iv- Introduction of new species

Introduction of non-native species is an important and often overlooked cause of

extinction. When new species are introduced to ecosystems, the established species in that ecosystem may not survive. The new organisms may be predators, parasites, or simply aggressive species that deprive the established species of nutrients, water, and light. For example, Eucalyptus plants were imported from Australia and introduced in Pakistan. These plants consume more water and have disturbed the water table (level of underground water). It harms other small plants that grow near Eucalyptus trees.

Domino effects

Domino effects occur when the removal of one species (an extinction event) or the addition of one species (an invasion event) affects the entire biological system.

Domino effects are especially likely when two or more species are highly interdependent. For example: a starfish facilitates the coexistence of many other invertebrates by eating mussels, which otherwise would harm other organisms. If starfish are eliminated from an ecosystem, mussel grow in number and prey on

other animals.

Pollution

Pollution from chemical contaminants certainly poses a further threat to species and ecosystems. While not commonly a cause of extinction, it harms those species whose range is extremely small.

Climate changes

A changing global climate (due to pollution and global warming) threatens species and ecosystems. The distribution of species (biogeography) is largely determined by climate. When changes in climate disturb the distribution of species, many species find it difficult to adjust themselves in new climate.

~~~~~ Q no 7 ~~~~~

Identify causes of deforestation and its effect on biodiversity?

Ans:

### Causes of deforestation

(i) Sometime there is slow forest degradation and sometime sudden and catastrophic clear-cutting for urban development.

(ii) Deforestation can be the result of the deliberate removal of forests for agriculture or urban development, or it can be a consequence of grazing animals.

(iii) The utilization of forest products, including timber and fuel wood, have played a key role in human societies.

## Effects of deforestation

### Erosion

Deforestation affects the amount of water in the soil and the moisture in the atmosphere. When there are no trees to keep the soil in place, the soil becomes exposed for erosion.

### Less protection from wind and rain

There is less protection from wind and rain and heavy rainfall washes the soil into rivers.

### Washing of essential nutrients

Essential nutrients are washed out of the soil all-together. Rivers become choked up with mud and silt, which can cause floods.

## Silted water :-

The silted water gets stored in dams and it reduces their water storage capacity and thus their lives.

## Reduce the sources of rains

Deforestation also contributes to decrease transpiration, which lessens cloud formation and less humidity. This ultimately reduces the sources of rains.

## Q No 8

Describe some of the programs running in Pakistan for the conservation of biodiversity?

Ans:

Following are a few examples of environmental work that has been carried out in Pakistan in order to conserve species and the associated habitats.

### (i) National Conservation Strategy

In 1980's the IUCN and the government of Pakistan formulated the National conservation strategy for Pakistan for the conservation of Pakistan's biodiversity.

## UN Convention on Combating Desertification (CCD).

This is an international treaty against damage and poverty in drylands. Pakistan signed Uos in 1997.

U

## Himalayan Jungle Project (HJP)

It started in 1991 in the Palas Valley, in Khyber Pakhtunkhwa (KP). It aimed at protecting one of the richest areas of biodiversity in Pakistan.

## Conservation of Biodiversity of the Sulaiman Range :-

Sulaiman Range Chilghora Forest is the largest Chilghora forest in the world. In 1992, the WWF-P started its conservation program.

## Northern Areas Conservation Project

The northern areas of Pakistan serve as a habitat for a number of wildlife species. The survival of these species is under threat. The NACP is a



project of WWF-P which is successful in implementing a ban on the hunting of these species.

### Conservation of migratory birds in Chitral (KP)-

Chitral lies on the migratory route of several important bird species. These birds face enormous hunting pressure. WWF-Pakistan initiated efforts to reduce the hunting pressure in 1999. The efforts proved successful.

### Conservation of Chiltan Markhor

Hazarigari National Park is located close to Quetta and is the only remaining habitat of Chiltan Markhor in the country. WWF-Pakistan developed the management plan of the park.

### Ban on games

Foreigners visit the northern areas and play many games in which bears are used. WWF-Pakistan has been successful in imposing a ban on this illegal practice.

## Chapter # 3-

### "Biodiversity"

#### Short Questions:-

~~~~~ Q No 1 ~~~~~

What is difference between the modes of nutrition of fungi and animals?

Ans:-

Kingdom Fungi:-

It includes eukaryotic multicellular heterotrophs which are absorptive in their nutritional mode e.g. mushrooms. Most fungi are decomposers. They live on organic material, secrete digestive enzymes and absorb small organic molecules formed by the digestion by enzymes.

Kingdom Animalia:-

It includes eukaryotic multicellular consumers. Animals live mostly by ingesting food and digestion it with in specialized cavities. They lack cell wall and show movements.

Q No 2

It is difficult to use the criterion of interbreeding to define species of unicellular organisms. Why?

Ans→

The criteria of interbreeding cannot be used for species recognition in organisms who reproduce asexually and do not interbreed with one another (for example many unicellular organisms).

Q No 3

How are taxonomy and systematics related?

Ans→

Taxonomy→

The branch of biology which deals with classification is called taxonomy.

Systematic→

The branch of biology which deals with classification and also traces the evolutionary history of organisms is known as systematics.

Relation between taxonomy and systematic→

The main aims of both these branches:

(i) To determine similarities and differences among organisms so that they can be studied easily.

Q No 4

Differentiate between the terms "extinct" and "endangered".

Ans:

Endangered Species

Endangered species are ones that have a very small population and that population exists at a greater risk of becoming extinct. Many species that become extinct never make to the endangered species list.

Extinct species

Extinct species are ones that are either known (documented) to be extinct or are so few in population that a recovery is considered highly unlikely even under excellent condition.

Q No 5

What are the contributions of Whittaker, Margulis and Shwartz in taxonomy?

Ans:

Robert Whittaker:-

In 1967, Robert Whittaker introduced the five-kingdom classification system.

Margulis and Shwartz-

In 1988, Margulis and Shwartz modified the five-kingdom classification of Whittaker. They considered genetics along with cellular organization and mode of nutrition in classification. They classified the organisms into the same five kingdoms as proposed by Whittaker.