

Short Answer Questions-I (PYQ)

[2 Marks]

Q.1. State the use of biodiversity in modern agriculture.

Ans. Biodiversity is a source of hybrids, GM plants, biopesticides, organic farming, bio fertilizer, improved varieties of plants, disease resistant plants. (*Any two*)

Q.2. In the biosphere immense biological diversity exists at all levels of biological organisation. Explain any two levels of biodiversity.

Ans. Biodiversity

- The occurrence of different types of genes, gene pools, species, habitats and ecosystems in a particular place and various parts of earth is called biodiversity.
- The term 'biodiversity' was given by Edward Wilson.
- Biodiversity is divided into three levels :
 - i. **Genetic diversity**
 - It is the measure of variety in genetic information contained in the organisms.
 - It enables a population to adapt to its environment.
 - For example, medicinal plant *Rauwolfia vomitoria* growing in Himalayan ranges shows variation in potency and concentration of the active chemical reserpine that it produces.
 - There are more than 50,000 genetically different strains of rice and 1,000 varieties of mango in India.
 - ii. **Species diversity**
 - It is a measure of the variety of species and their relative abundance present within a region.
 - For example, the Western Ghats have a greater amphibian species diversity than the Eastern Ghats.
 - iii. **Ecological diversity**
 - It is a measure of the diversity at community and ecosystem levels. They represent the local, unique habitat and regional components of species diversity.
 - For example, ecological diversity is greater in India due to presence of large number of ecosystems like deserts, rainforests, coral reefs, wetlands, estuaries and alpine meadows.

Q.3. Mention the kind of biodiversity of more than a thousand varieties of mangoes in India represent. How is it possible?

Ans. Thousand varieties of mangoes represent genetic diversity. This is possible because:

- i. Single species show high diversity at genetic level over its distributional range.
- ii. Different varieties grow in different geographical areas.
- iii. Mutations.

Q.4. List the features that make a stable biological community.

Ans. Features of a stable community are as follows:

- i. Communities should have greater biodiversity for greater stability.
- ii. It should be able to prevent invasion by alien species.
- iii. It should be able to restore itself in a short period of time.
- iv. Variations should be minimal in the community.

Q.5. “Stability of a community depends on its species richness.” Write how did David Tilman show this experimentally.

Ans. David Tilman found that plots with more species showed less year-to-year variation in total biomass. He also showed that in his experiments, increased diversity contributed to higher productivity.

Q.6. Biodiversity must be conserved as it plays an important role in many ecosystem services that nature provides. Explain any two services of the ecosystem.

Ans. The two ecosystem services are:

- i. Forest ecosystem purify air, mitigate droughts and floods.
- ii. The cycling nutrients generate fertile soil and maintains biodiversity.

Q.7. Explain, giving one example, how co-extinction is one of the causes of loss of biodiversity. List the three other causes also (without description).

Ans. When a species becomes extinct, the plant and animal species associated with it in an obligatory may also become extinct. This is called co-extinction. For example, when a host fish species becomes extinct, its unique assemblage of parasites also becomes extinct.

The three other causes are:

- i. Habitat loss and fragmentation
- ii. Over-exploitation
- iii. Alien species invasion.

Q.8. Narrowly utilitarian arguments are put forth in support of biodiversity conservation. Explain the other two arguments that are put forth in support of the same cause.

Ans.

1. **Broadly utilitarian arguments**
 - Biodiversity plays a major role in maintaining and sustaining supply of goods and services from various species as well as ecological systems.

- The different ecological services provided are:
 - a. Amazon forest is estimated to contribute 20 per cent of the total oxygen in the atmosphere on earth.
 - b. Ecosystem provides pollinators like bees, bumble bees, birds and bats which pollinate plants to form fruits and seeds.
 - c. Aesthetic pleasures like bird watching, spring flowers in full bloom, walking through the thick forest, waking up to a bulbul's song, etc. are some other benefits of the ecosystem.

2. Ethical reasons

- There are thousands of plants, animals and microbes on this earth which are not useless. Every one has some intrinsic value even if it is not of any economic value to us.
- It is, therefore, our moral duty to ensure well-being of all the living creatures for the utilisation of future generations.

Q.9. State how does *ex-situ* conservation help in protecting biodiversity.

Ans. *Ex situ* conservation (Off-site conservation)

- This approach involves placing threatened animals and plants in special care units for their protection.
- India has 35 botanical gardens and 275 zoological parks where animals which have become extinct in wild are maintained.
- By using cryopreservation (preservation at -196°C) technique, sperms, eggs, animal cells, tissues and embryos can be stored for long period in genes banks, seed banks, etc.
- Plants are propagated *in vitro* using tissue culture methods (micropropagation).
- It is the desirable approach when urgent measures to save extinction are required.

S. No.	In situ conservation	Ex situ conservation
(i)	It is conservation and protection of biodiversity in its natural habitat.	It is conservation of selected threatened plant and animal species in places outside their natural habitat.
(ii)	Population is conserved in the surroundings where they have developed their distinctive features.	Population is conserved under simulated conditions that closely resemble their natural habitats.
(iii)	<i>E.g.</i> , national parks, biosphere reserves, wildlife sanctuaries, etc.	<i>E.g.</i> , botanical gardens, zoological parks, wildlife safari, gene banks, etc.

Q.10. Where would you expect more species biodiversity— in tropics or in polar regions? Give reasons in support of your answer.

Ans. More biodiversity is found in the tropics. This is because tropical regions remain undisturbed from frequent glaciations as in polar regions. Also, the tropics are less seasonal/more constant.

Q.11. Why are certain regions on the Earth called hot-spots? Name any two hot-spots in India.

Ans. Certain regions have been declared as “hot spots” for maximum protection of these regions which have high levels of species richness and high degree of endemism.

Western Ghats and Sri Lanka and Himalayas are two example of hot-spots.

Q.12. Justify with the help of an example where a deliberate attempt by humans has led to the extinction of a particular species.

Ans. When Nile perch, a large predator fish, was introduced in Lake Victoria, it started feeding on the native fish, cichlid fish. As a result, cichlid fish became extinct and Nile perch, not finding any food for itself, died too.

Q.13. Differentiate between in situ and ex situ approaches of conservation of biodiversity.

Ans.

S. No.	<i>In situ</i> approach	<i>Ex situ</i> approach
(i)	It involves protection of endangered species of plants and animals.	It involves protection of endangered species by removing them from the natural habitat
(ii)	This is done by protecting the natural habitat or ecosystem.	This is done by placing the species under special care.

Q.14. Why are sacred groves highly protected?

Ans. Sacred groves are highly protected because of religious and cultural traditions. These are refuges for large number of rare and threatened plants. They are ecologically unique and biodiversity rich regions.

Q.15. List any four techniques where the principle of *ex-situ* conservation of biodiversity has been employed.

Ans. Cryopreservation, in vitro fertilisation, micropropagation/tissue culture sperm bank/seed bank/gene bank.

Q.16. A particular species of wild cat is endangered. In order to save them from extinction, which is a desirable approach in-situ or ex-situ? Justify your answer and explain the difference between the two approaches.

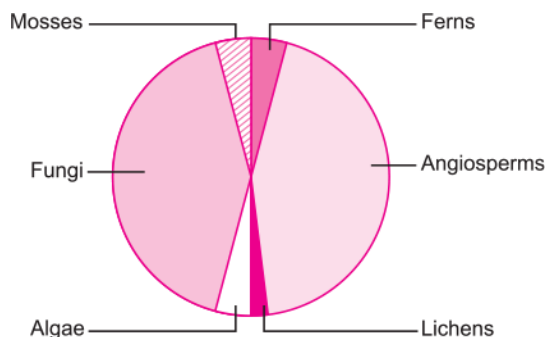
Ans. *Ex-situ* is a desirable approach to protect the wild cat. The organism is protected outside their natural habitat where special care is taken to protect them. By using

cryopreservation techniques, gametes of threatened species can also be preserved under very low temperature.

For difference, refer to Basic Concepts Point 8.

Q.17. Observe the global biodiversity distribution of major plant taxa in the diagram alongside and answer the questions that follow.

- Which group of plants are most endangered?
- Why are mosses/ferns so few? Give reason.
- How do fungi that are heterotrophs sustain themselves as a large population?
- Which group of plants is most advanced and which one is most primitive?



Ans.

- Lichens.
- Mosses and ferns are few as they need humid conditions in forests that are fast disappearing.
- Fungi are able to sustain themselves as a large population because of their wider adaptability to the changing environmental conditions.
- Most advanced group is of angiosperms and most primitive group is of fungi.

Short Answer Questions-I (OIQ)

[2 Mark]

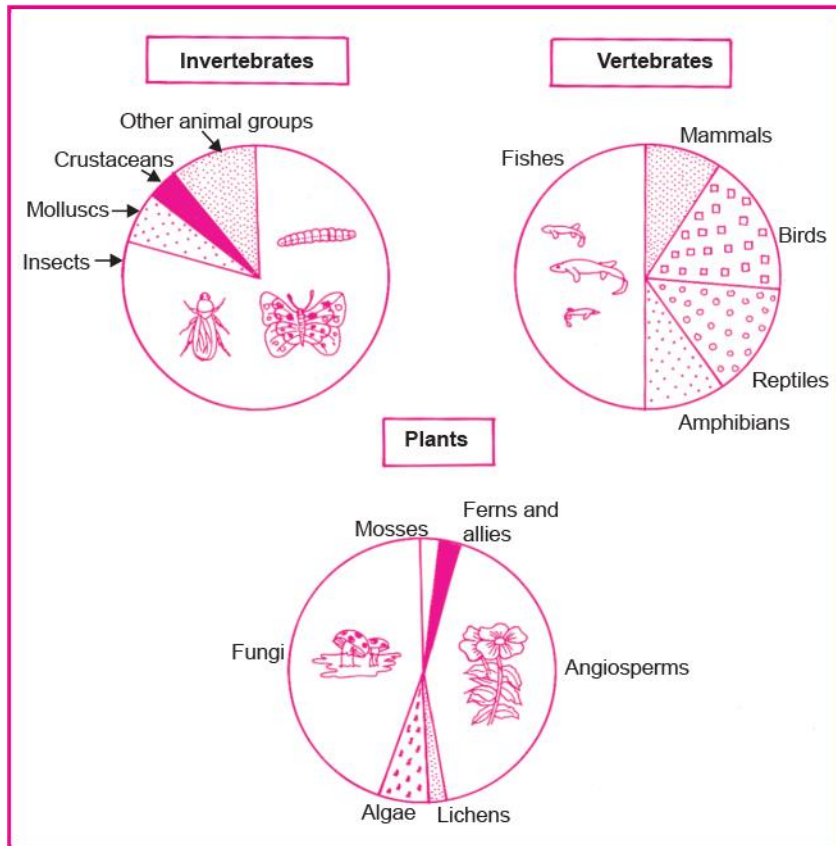
Q.1. What are the different levels of biodiversity?

Ans. There are three levels of biodiversity:

- Genetic diversity
- Species diversity
- Ecological diversity

Q.2. Represent diagrammatically the proportion of different groups of plants, invertebrates and vertebrates (Global biodiversity).

Ans.



Q.3. Among the ecosystem services are control of floods and soil erosion. How is this achieved by the biotic components of the ecosystem?

Ans.

Control of soil erosion: Plant roots hold the soil particles tightly and do not allow the top soil to be drifted away by winds or moving water. Plants increase the porosity and fertility of the soil.

Control of floods: It is carried out by retaining water and preventing run off of rain water. Litter and humus of plants function as sponges thus, retaining the water which percolates down and get stored as underground water. Hence, the flood is controlled.

Q.4. What is biodiversity? Why is it a matter of concern now?

Ans. Biodiversity is the occurrence of different types of genes, gene pools, species, habitats and ecosystems in a particular place and various parts of earth. It is a matter of concern because species are continuously lost, limiting the diversity and this will affect our survival and well-being on earth due to the changes in environment.

Q.5. What is fragmented habitat? Give one example.

Ans. When large sized habitats are broken into smaller parts due to human activities they are called fragmented habitat and it leads to population decline. Example, a small forest near an urban settlement.

Q.6. What is the ecological importance of biodiversity?

Ans. The ecological importance of biodiversity:

- i. Biodiversity is required for maintaining and sustainable use of goods and services from ecosystem.
- ii. Various insects help in pollination.
- iii. Various micro-organisms help in the decomposition of organic matter thereby increasing the soil fertility and cleaning the environment.
- iv. Various drugs and medicines are extracted from plants.

Q.7. What does the term genetic diversity refer to? What is the significance of large genetic diversity in a population?

Ans. Genetic diversity is the measure of variety in genetic information contained in the organisms. Significance of large genetic diversity are as follows:

- i. Larger genetic diversity provides adaptability at the time of environmental changes and helps the species in surviving.
- ii. Larger genetic diversity is also useful in the evolution of species.

Q.8. Describe with example the latitudinal gradients of biodiversity.

Ans. Latitudinal gradients

- a. Biodiversity increases from poles to equators, i.e., from high to low latitude.
- b. Tropics (23.5°N to 23.5°S) have more species than temperate or polar regions. For example, Columbia located near the equator has 1,400 species of birds while New York (41.5°N) has 105 species and Greenland (71°N) has only 56 species.

Q.9. List any four factors which may lead to loss of biodiversity.

Ans. Causes of Biodiversity Losses

There are four major causes of biodiversity loss. These are also known as ‘**The Evil Quartet**’.

- i. **Habitat loss and fragmentation**
- ii. **Over-exploitation**
- iii. **Alien (exotic) species invasions**
- iv. **Co-extinctions**

Q.10. What is IUCN red list? Give any two uses of this list.

Ans. IUCN red list is a catalogue of species and subspecies that are facing the risk of extinction.

The two uses of this list are:

- i. Provides information and develops awareness about the importance of threatened species.
- ii. Identification and documentation of endangered species.

Q.11. Why are conventional methods not suitable for the assessment of biodiversity of bacteria?

Ans. Many bacteria are not culturable under normal condition in the laboratory. This becomes a problem in studying their morphological, biochemical and other characterisations which are useful for their assessment. Thus conventional methods are not suitable.

Q.12. Is it true that there is more solar energy available in the tropics? Explain briefly.

Ans. As one moves from the equator to the polar regions, the length of the day decreases and the length of the night increases. The length of day and night are same at the equator.

Therefore, it is true that there is more solar energy available in the tropics.

Q.13. How is the presently occurring species extinction different from the earlier mass extinctions?

Ans. Species extinction occurring at present is due to anthropogenic or man-made causes whereas the earlier extinction was due to natural causes.

Q.14. In an experiment, the slope of regression (Z) is 0.2 and in another experiment the value obtained is 1.2. Explain the two situations in respect of species area relationships.

Ans. 0.2 is obtained in studies regardless of the taxonomic group or the region 1.2 is obtained if species area relationship is analysed among very large areas like the entire continents.

Q.15. Discuss one example, based on your day-to-day observations, showing how loss of one species may lead to extinction of another.

Ans. In case a species becomes extinct, the plant and animal species associated within an obligatory way also become extinct. For example,

- i. When a fish species which is a host for a number of parasites becomes extinct, the parasite species which are uniquely dependent on the host fish will also become extinct.
- ii. The insects may be polyphagous (feed on more than one plant species) or monophagous (feed on only one particular plant species) in nature. The monophagous insect species are valuable and may become extinct if the plant species upon which it feeds becomes extinct.

Q.16. Would the extinction of one insect pollinator affect the ecosystem? Explain.

Ans. It would affect the ecosystem because insect pollinators form a part of food web. It may lead to co-extinction of species in the case of a co-evolved plant. It is a case of mutualism where extinction of one invariably leads to the extinction of the other.

Q.17. Seeds of different genetic strains are kept for long periods in seed banks. Explain the conservative strategy involved in this process.

Ans. The strategy is called *Ex-situ* conservation. In this technique, seeds are preserved in viable and fertile condition for long periods using cryopreservation techniques.

Q.18. *Lantana* and *Eichhornia* are examples of two weeds. How do they affect the ecosystem?

Ans. These are examples of Alien species invasions. They threaten the indigenous species and lead to their extinction.

Q.19. Assess the effects of loss of biodiversity in a region. Mention any four such effects.

Ans.

- i. Decline in plant production and animal species
- ii. Lowered resistance to environmental perturbations such as drought
- iii. Increased variability in certain ecosystem processes such as plant productivity/water use/pest and disease cycles.
- iv. Increased rate of species extinction.

Q.20. What is cryopreservation? Give its one use.

Ans. Cryopreservation is a preservation technique in which sperms, eggs, cells, tissues, etc., are stored at ultra-low temperature of -196°C under nitrogen. Cells and gametes of threatened species can be preserved by this method.

Q.21. Interpret two effects of loss of biodiversity in a region.

Ans.

- i. Decline in plant production.
- ii. Lowered resistance to environmental perturbations such as drought.

- iii. Increased variability in certain ecosystem processes such as plant productivity, water use, and pest and disease cycles. (*Any two*)

Q.22. Which region/biome in the world is considered as the 'Lungs of the planet'? Give two reasons for its degradation.

Ans. The Amazon rain forests are considered as the lungs of the planet. They are cut and cleared for cultivation of soya beans. Some part has been converted into grass lands for raising beef cattle.

Q.23. Which type of conservation measures, in situ or ex situ, will help the larger number of species to survive? Explain.

Ans. *In situ* conservation measures will help larger number of species to survive because this approach involves protection of species in their natural habitat, e.g., national parks, sacred groves, biodiversity hot spots, etc.