Long Answer Questions (PYQ)

[5 Marks]

Q.1. Explain, giving three reasons, why tropics show greatest levels of species diversity.

Ans.

i. Tropical latitude have remained relatively undisturbed and have had a long evolutionary time for species diversification.
ii. Tropical environments have less seasonal variations, more constant and predictable environmental conditions. This promotes niche specialisation for greater species diversity.
iii. There is more availability of solar energy which contributes to higher productivity.

Q.2. Answer the following questions:

Q. Why is there a need to conserve biodiversity?

Ans. Reasons for Biodiversity Conservation

- There are three main reasons for conserving the biodiversity which have been classified into the following categories:
  i. **Narrowly utilitarian arguments**
     - Human beings derive direct economic benefits from nature, like food, firewood, fibre, construction material, industrial products (resins, gums, dyes, tannins, etc.) and medicinally important products.
  ii. **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.
  iii. **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.

Q. Name and explain any two ways that are responsible for the loss of biodiversity.

Ans. Habitat loss and fragmentation

- Destruction of habitat is the primary cause of extinction of species.
- The tropical rainforests initially covered 14 per cent of the land surface of earth, but now cover only 6 per cent of land area.

Over-exploitation

- When biological system is over-exploited by man for the natural resources, it results in degradation and extinction of the resources.
- For example, Stellar's sea cow, passenger pigeon and many marine fishes.

Q.3. Answer the following questions:

Q. Why should we conserve biodiversity? How can we do it?

Ans. Reasons for Biodiversity Conservation

- There are three main reasons for conserving the biodiversity which have been classified into the following categories:
  i. **Narrowly utilitarian arguments**
     - Human beings derive direct economic benefits from nature, like food, firewood, fibre, construction material, industrial products (resins, gums, dyes, tannins, etc.) and medicinally important products.
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  iii. **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.

Q. Explain the importance of biodiversity hot-spots and sacred groves.

Ans. Biodiversity hot spots

- These are regions of high levels of species richness and high degree of endemism.
- Endemic species are species confined only to a limited region.
- There are 34 hot spots in the world.
- In India, the three hot spots are Western Ghats and Sri Lanka, Indo–Burma and Himalaya.
- These reduce mass extinction by 30%.

Sacred groves

- These are forest patches set aside for worship. All the trees and wildlife within are given total protection by tribal people.
- Large number of rare and threatened plants can be found in these regions.
- Some of the sacred groves in India are as follows:
  — Khasi and Jaintia Hills in Meghalaya
  — Western Ghat regions of Karnataka and Maharashtra
  — Aravalli Hills of Rajasthan
  — Sarguja, Chanda and Bastar areas of Madhya Pradesh.

Q.4. Answer the following questions:

Q. What are the two types of desirable approaches to conserve biodiversity? Explain with examples bringing out the difference between the two types.

Ans. In situ conservation

i. It is conservation and protection of biodiversity in its natural habitat.
ii. Population is conserved in the surroundings where they have developed their distinctive features.
iii. *E.g.*, national parks, biosphere reserves, wildlife sanctuaries, etc.

Ex situ conservation

i. It is conservation of selected threatened plant and animal species in places outside their natural habitat.
ii. Population is conserved under simulated conditions that closely resemble their natural habitats.
iii. *E.g.*, botanical gardens, zoological parks, wildlife safari, gene banks, etc.

Q. What is the association between the bumble bee and its favourite orchid Ophrys? How would extinction or change of one would affect the other?

Ans. Commensalism because *Ophrys* employs sexual deceit to get pollination by species of bee as petal of its flower bears resemblance to female of the bee in size, colour and markings and so male bee is attracted to what it perceives as female; *pseudo* copulates with the flower and thus pollinates it. If the female bee's colour patterns change even slightly due to any reason during evolution, pollination success will be reduced unless the orchid flower co-evolves to maintain the resemblance of its petal to the female bee.

Q.5. Answer the following questions:

Q. Taking one example each of habitat loss and fragmentation, explain how are the two responsible for biodiversity loss.

Ans.

a. The Amazon rainforest (called the **"lungs of the planet"**) is being cut and cleared for cultivation of soya beans and for conversion into grasslands for raising beef cattle.
b. When large-sized habitats are broken or fragmented due to human settlements, building of roads, digging of canals, etc., the population of animals requiring large **territories and some animals with migratory habitats declines.**

Q. Explain two different ways of biodiversity conservation.

Ans. **In situ conservation**

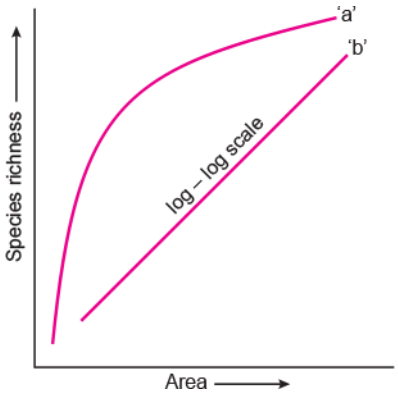
i. It is conservation and protection of biodiversity in its natural habitat.
ii. Population is conserved in the surroundings where they have developed their distinctive features.
iii. *E.g.*, national parks, biosphere reserves, wildlife sanctuaries, etc.

Ex situ conservation

i. It is conservation of selected threatened plant and animal species in places outside their natural habitat.
ii. Population is conserved under simulated conditions that closely resemble their natural habitats.
iii. *E.g.*, botanical gardens, zoological parks, wildlife safari, gene banks, etc.

Q.6. The following graph shows the species–area relationship. Answer the following questions as directed.

a. Name the naturalist who studied the kind of relationship shown in the graph. Write the observations made by him.
b. Write the situations as discovered by the ecologists when the value of 'Z' (slope of the line) lies between
i. 0.1 and 0.2
ii. 0.6 and 1.2
What does 'Z' stand for?
c. When would the slope of the line 'b' become steeper?



Ans.

a. lexander von Humboldt.
He observed that within a region, species richness increased with increasing explored area but only up to a limit.
b.
i. The slopes regression lines are similar when unaffected distribution in an area is analysed.

ii. The slope of regression is steeper when we analyse the species area relationship among very large areas like entire continent.
Z (slope of the line) is the regression co-efficient.

c. If species richness is more, *i.e*., in the range 0.62-1.2.

Long Answer Questions (OIQ)

[5 Marks]

Q.1. What are the reasons for biodiversity conservation?

Ans. Reasons for Biodiversity Conservation

- There are three main reasons for conserving the biodiversity which have been classified into the following categories:
  i. **Narrowly utilitarian arguments**
    - Human beings derive direct economic benefits from nature, like food, firewood, fibre, construction material, industrial products (resins, gums, dyes, tannins, etc.) and medicinally important products.
    - More than 25 per cent of the drugs are derived from plants and about 25,000 species of plants are used by native people as traditional medicines.
  ii. **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.
  iii. **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.2. Write notes on ex situ conservation of 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.

Q.3. Explain the efforts for the conservation of biodiversity at international level.

Ans. The Earth Summit was held at Rio de Janeiro (Brazil) in which representatives of more than 170 countries were present. The summit promoted Convention on Biological Diversity (CBD). India became signatory to this convention in May 1994.

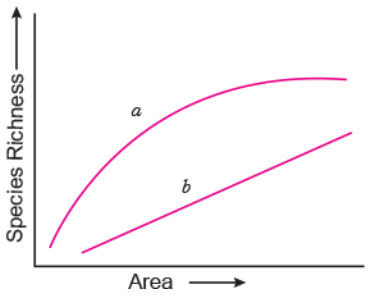
The major objectives were:

i. Finding and supporting various methods to conserve biological diversity.
ii. Use of biodiversity only up to sustainable limit.
iii. The benefits derived from use of genetic resources should be fairly and equitably shared.

A second world summit on biological diversity was held in 2002 in Johannesburg, South Africa. In the Summit, 190 countries pledged to reduce the current rate of biodiversity loss at global, regional and local levels by 2010.

Q.4. The graph shows species-area relationship:

a. If *b* denotes the relationship on log scale-
i. Describe a and b.
ii. How is slope represented? Give the normal range of slope.
iii. What kind of slope will be observed for frugivorous birds and mammals in a tropical forest?
b. Species diversity of plants (22%) is much less than that of animals (72%). Analyze the reasons for greater diversity of animals as compared to plants.



Ans.

a.
i. *a* is $S = CA^2$ *b* is log S = log C + Z log A
ii. Slope is Z (regression coefficient). Its normal value ranges from 0.6 to 1.2.

iii. In frugivorous birds and mammals, value of Z=1.15

b. Reasons for greater diversity of animals are:
   i. Animal are mobile and can avoid predator or unfavourable event.
   ii. Well developed nervous system to receive stimuli against external factors and respond to them.

Q.5. Answer the following questions:

Q. Biologists are not sure about how many prokaryotic species there might be. Give reasons.

Ans. Biologists are not sure about the number of prokaryotic species because:

i. The conventional taxonomic methods are not sufficient for identifying these microbial species.
ii. Many of the species cannot be cultured under laboratory conditions.
iii. Biochemical and molecular biology techniques would put their diversity into millions.

Q. Would Western Ghats ecosystems be less functional if one of its tree frog species is lost forever? Substantiate your answer in the light of hypothesis proposed by Paul Ehrlich.

Ans. According to the hypothesis proposed by Paul Ehrlich, the “Rivet popper hypothesis”, each species is essential in the balance of nature. If one is lost that much imbalance is caused in the ecosystem.