CHAPTER 13

# Biodiversity and Conservation

## Level - 1 CORE SUBJECTIVE QUESTIONS

### MULTIPLE CHOICE QUESTIONS (MCQs) (1 Mark)

1. Option (A) is correct.
   **Explanation:** Habitat fragmentation reduces the size of habitat patches, leading to a decline in large animal populations, lower biodiversity, and increased competition from surrounding areas due to limited resources and space.
2. Option (C) is correct.
   **Explanation:** The IUCN Red Data List (2004) documented the extinction of approximately 784 species over the past 500 years, including around 359 invertebrates.
3. Option (B) is correct.
   **Explanation:** The Aravalli Hills are located in north western India, primarily in the states of Rajasthan, Haryana, and Gujarat, not Karnataka.
4. Option (D) is correct.
   **Explanation:** *Ex situ* conservation involves protecting an endangered species outside its natural habitat, such as in a seed bank, botanical garden, or zoo. A seed bank stores seeds of various plant species as a means of preserving genetic diversity.
   Sacred Groves, National Park, Biosphere Reserve are examples of *in situ* conservation, which occurs in the natural habitat of the species.

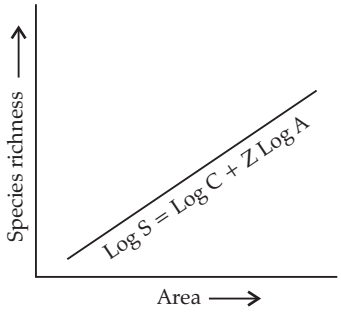
### ASSERTION-REASON QUESTIONS (1 Mark)

1. Option (B) is correct.
   **Explanation:** Loss of biodiversity can result from the over exploitation of resources. The introduction of *Clariasgari epinus* in Indian rivers has led to a decline in native Indian fishes and is classified as an alien species invasion.
2. Option (B) is correct.
   **Explanation:** Hotspots are areas of high endemism and high levels of species richness. Since Western Ghats has a very large number of endemic species it is considered as a biodiversity hotspot.
   It is true that Western Ghats have greater amphibian species diversity as compared to Eastern Ghats but reason is not the correct explanation of assertion.
3. Option (C) is correct.
   **Explanation:** Habitat destruction is a leading cause of biodiversity loss, resulting in the decline and extinction of various species. While this destruction can increase edge areas and decrease core habitats, such changes do not directly explain the loss of biodiversity.

### VERY SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. **(i)**
   - Prickly pear cactus / Opuntia.
   - Being exotic species it become invasive as it did not have any natural predators.

   **(ii)** By introducing cactus feeding predator (a moth) from its natural habitat.
2. Introduction of Nile perch introduced into Lake Victoria, led eventually to the extinction of more than 200 species of Cichlid fish.
   African catfish / *Clariasgari epinus*, causes threat to indigenous catfish
   Parthenium/ carrot grass/ Lantana/ Water hyacinth/ *Eicchornia sp.*, causes threat to native species.
3. **(i)**

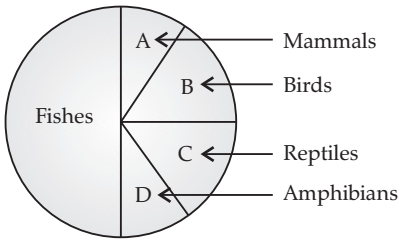



**(ii)** Log S = Log C + Z Log A

4. 2.4 percent
8.1 percent share of the global species diversity.
5. **(i)** Shark harvest increases over the years from 1992 to 2003.
**(ii)** Biodiversity decreases due to over exploitation/ excessive harvesting.
6. Tilman conducted experiments in outdoor plots, plots with more species shows less year to year variation in biomass (more stability).
7. **(i)** (I) Y, (II) X
**(ii)** Y will show high biological diversity
**Reason:** less seasonal / constant and predictable environment, more solar energy available for species diversification

## SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. **(i)**




½ × 4

**(ii)** Dodo, Quagga, Thylacine, Steller's Sea Cow, 3 subspecies- Bali/ Javan/Caspian of tiger (or any other correct example - any two) ½ + ½

2. **(i)** Bio diversity hot spots are the regions with very high level of species richness and high degree of endemism.
Criteria used for determining any region as a hot spot – species richness, endemism.
**(ii)** Western Ghats and Sri Lanka, Indo-Burma and Himalayas. **(Any Two)**
3. Tropical Latitude have remained undisturbed and have had a long evolutionary time for species diversification, tropical environments have less seasonal variations with more constant and predictable environmental conditions to promote niche specialisation for greater diversity, there is more availability of solar energy which contributes to higher productivity. 3
4. (i) Oxygen production, pollination, aesthetic pleasure of thick woods and flowers, bird watching, mitigate droughts and floods, cycle nutrients, generate fertile soils, provide wildlife habitat, maintain biodiversity, provide storage site for carbon, provide aesthetic/ cultural/ spiritual values. **(Any two)**
(ii) Philosophical or spiritual realisation that every species has an intrinsic value / Moral duty to care for their well-being / pass on our biological legacy in good order to future generations.
5. (i) Panama—Tropic
Canada—Temperate
Denmark—Polar
**(ii)** Latitudinal gradient, species diversity decreases as we move away from equator toward poles / species diversity vary due to different climatic conditions present at different places of world.
6. **(i)**
- Five extinctions have already occurred
- Sixth is in progress

**(ii)** Sixth extinction is much faster / sixth extinction is 100 to 1000 times faster.
Human activities like industrialisation, loss of habitat, over exploitation, land reforms.
**(Any two)**
7. Paul – Ehrlich compared Airplane with ecosystem, in an airplane (ecosystem) all parts are joined together using thousands of rivets (species), if every passenger travelling in it starts popping a rivet to take home (causing a species to become extinct), it may not affect flight safety (proper functioning of ecosystem). Initially, if more and more rivets are removed then the plane becomes dangerously weak over a period of time, loss of rivets on the wings (Key species that drives major ecosystem functions) is a more serious threat to flight.
8. **(i)** Extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.
**(ii)** Carrot grass / *(Parthenium)*, Lantana, water hyacinth / *(Eichhornia)* (or any correct example).
9. **(i)** Yes
(1) Degradation of habitats by fragmentation threatens the survival of many species.
(2) Mammals / birds / migratory birds which require large territories (are badly affected), leading to decline of population.
**(ii)** Fragments / Fragmentation.
10. **(i)** Species richness increased with increasing explored area up to a limit.
**(ii)** S = Species richness, Z = Slope of the line / regression coefficient, A = Area, C = Y-intercept
11. **(1)** Source of oxygen in the earth's atmosphere, Pollination (without which plants cannot produce fruits or seeds), is another service provided by forest through different pollinators,
**(2)** Source of aesthetic pleasures (walking through thick woods / watching spring flowers in full bloom / waking up of bulbul's song in the morning), Human derive countless economic benefits from nature-food (cereals, pulses, fruits),
**(3)** Source of firewood / fibre / construction material / industrial products (tannins / lubricants / dyes / resins / perfumes).
**(4)** Contributes to the traditional medicines used by native people around the world, Philosophically or spiritually, we need to realise that every species has an intrinsic value, even if it may not be of current or any economic value to us,
**(5)** This is the ethical argument for conserving forests which relates to what we owe to the millions of plants / animals / microbe species with whom we share this planet. (Any three)

**12. (i)** X – Insects
Y – Molluscs

**(ii)** X – makes most species rich taxonomic group
More than 70% of the total

**13. (i)** Loss of habitat leads to loss of biodiversity and threatens the survival of plants and animals to extinction.
Mammals and birds requiring large territories and certain animals with migratory habits are badly affected due to fragmentation, leading to population decline.

**(ii)** Many commercially important species are over harvested, endangering their existence which may lead to their extinction.

**14. (i)** S – Species richness
A – Area
Z – Slope of line/regression coefficient
C – Y-intercept

**(ii)** Z values in the range of 0.6 1.2 **1**

**15. (i)** Species confined to a particular (geographical) region, and not found anywhere else.

**(ii)** Western Ghats, Himalaya, Indo-Burma, Sri Lanka

## LONG ANSWER TYPE QUESTIONS (5 Marks)

**1. (i)** There are three main reasons for conserving the biodiversity which have been classified into the following categories: **(Any two reasons)**

(1) 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.

(2) 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:

- Amazon forest is estimated to contribute 20 per cent of the total oxygen in the atmosphere on earth.
- Pollinators like bee, bumble bees, birds and bats pollinate plants to form fruits and seeds.
- 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.

(3) Ethical reasons there are thousands of plants, animals and microbes on this earth which are not useless. Everyone 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.

**(ii)** There are four major causes of biodiversity loss. These are also known as 'The Evil Quartet'.
**(Any two Ways)**

(1) **Habitat loss and fragmentation:** Destruction of habitat is the primary cause of extinction of species. 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.

(2) **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.

(3) **Alien (exotic) species invasions:** Some alien (exotic) species when introduced unintentionally or deliberately, become invasive and cause harmful impact, resulting in extinction of the indigenous species. Nile perch, a large predator fish when introduced in Lake Victoria (East Africa) caused the extinction of an ecologically unique species of Cichlid fish in the lake.

(4) **Co-extinctions:** When a species becomes extinct, the plant and animal species associated with it in an obligatory manner, also become extinct. For example, if the host fish species becomes extinct, all those parasites exclusively dependent on it, will also become extinct.

**2. (i)**

| 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) | Example: National parks, biosphere reserves, wildlife sanctuaries, etc. | Example: Botanical gardens, zoological parks, wildlife safari, gene banks, etc. |

**(ii)** A stable community should not show too much variation in productivity from year to year; it must be either resistant or resilient to occasional disturbances (natural or man-made) and it must also be resistant to invasions by alien species.

3. Biodiversity should be conserved for the following three reasons:
   **(1)** Narrowly utilitarian
   Humans derive countless economic benefits from nature-e.g. food (cereals, pulses, fruits) / firewood / fibre / construction material / industrial products (Tannins, lubricants,dyes,resins, perfumes) / Products of medicinal importance. **(Any one)** ½
   **(2)** Broadly utilitarian
   Play role in many ecological services e.g. production of $O_2$ / pollination / Aesthetic pleasures
   **(3)** Ethical
   Every species has an intrinsic value / we have a moral duty to care for their well-being/ pass on our biological legacy in good order to future generations.
   **The two approaches to save tiger are:**
   **(1)** *In situ* conservation
   Protect the natural habitat the forest where the tiger lives / protect the whole ecosystem to save tigers.
   **(2)** *Ex situ* conservation
   Threatened tigers are taken out of their natural habitat and placed in special settings for protection and special care / e.g. zoological park, wildlife sanctuaries.
4. **(i)** **(1)** Have remained relatively undisturbed for millions of years / had a long evolutionary time for species diversification.
   **(2)** Environment less seasonal / more constant and predictable / such constant environment promotes niche specialisation.
   **(3)** More solar energy available in the tropics contributes to higher productivity and greater diversity.
   **(ii)** **Habitat loss:** Amazon rain forest is being cut for cultivating soyabeans / degradation of habitat by pollution / human activities leading to clearing of forests for commercial or tourism purpose
   **Alien species invasion:** The Nile perch introduced into Lake Victoria in East Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake. Recent illegal introduction of the African catfish *Clariasgarie pinus* for aqua culture purposes is posing a threat to the indigenous catfishes in our rivers / carrot grass / lantana / water hyacinth causes threat to our indigenous species.
5. **(i)** Alien species invasion: When alien species are introduced unintentionally / deliberately for whatever purpose, some of them turn invasive and cause decline / extinction of indigenous species
   E. g.
   - The introduction of African catfish / *Clariasgari epinus* (for aqua culture purpose) poses a threat to indigenous catfishes in our rivers.
   - The Nile perch introduced into Lake Victoria in East Africa led to the extinction of more than 200 species of Cichlid fish in the lake.
   - Carrot grass / Parthenium, Lantana , Water hyacinth /Eichhornia poses a threat to indigenous species

   **Fragmentation:** When large habitats are broken up into small fragments due to various human activities
   - Mammals / birds requiring large territories and certain animals with migratory habits are badly affected

   **Habitat Loss:** The Amazon rain forest is being cut and cleared for cultivating soyabeans / conversion to grasslands for raising cattle
   **(ii)** **(1)** Provides information of extinction of species
   **(2)** Regions with very high levels of species richness , high degree of endemism /species confined to that region and not found anywhere else are identified which need to be conserve all priority basis.

## Level - 2 ADVANCED COMPETENCY FOCUSED QUESTIONS

### MULTIPLE CHOICE QUESTIONS (MCQs) (1 Mark)

1. Option (C) is correct.
   **Explanation:** The species-area relationship on a log scale is represented by a linear relationship. When both the number of species (S) and the area (A) are plotted on a logarithmic scale, the relationship becomes a straight line, described by the equation:
   Log S = Log C + Z log A
   Where S is the number of species, A is the area, C is a constant, and Z is the slope of the line.
2. Option (C) is correct.
   **Explanation:** Cryopreservation is an *ex situ* conservation method that involves preserving the genetic material of endangered species at extremely low temperatures. It allows for the long-term storage of cells, tissues, seeds, or embryos outside their natural habitat, helping to conserve species that are at risk of extinction.
   Other options like biosphere reserves, national parks, and wildlife sanctuaries are examples of *in situ* conservation,
3. Option (D) is correct.
   **Explanation:** Each example illustrates biodiversity. Together, they encompass the different aspects of biodiversity.
4. Option (B) is correct.
   **Explanation:** As we move from islands closer to the mainland to those further away, the slope of the species-area relationship (SAR) is likely to decrease. This is because islands that are closer to the mainland tend to have higher species richness due to easier dispersal of species from the mainland. In contrast, islands that are farther away may experience lower immigration rates and consequently have fewer species, leading to a decrease in the slope of the

regression line representing species richness against area.

5. Option (D) is correct.
**Explanation:** The introduction of the zebra mussel into the lakes of the United States is an example of alien species invasion, as it involves a non-native species being introduced to a new ecosystem, often leading to ecological imbalances.
6. Option (A) is correct.
**Explanation:** Increasing the area for analysis (P) typically leads to a steeper slope in the species-area relationship because larger areas can support more species due to greater habitat diversity and resource availability.
7. Option (A) is correct.
**Explanation:** According to the concept of species-area relationship, within a region, species richness gets increased when explored area is increased, but only up to a limit.

## ASSERTION-REASON QUESTIONS (1 Mark)

1. Option (A) is correct
**Explanation:** Assertion is true. Tropical regions do have higher species richness compared to temperate zones. This is a well-documented ecological pattern.
Reason is also true. The stable climate and long evolutionary time without major disruptions in tropical regions allow species to evolve, diversify, and persist, leading to high biodiversity.
2. Option (A) is correct
**Explanation:** Assertion is true. Biodiversity is crucial for maintaining ecosystem stability and resilience because it supports various ecological functions such as nutrient cycling, pollination, and climate regulation.
Reason is also true. Ecosystems with greater species diversity have a higher chance that some species can withstand or adapt to environmental changes, helping the system recover and continue providing services like clean air, water, and food.
3. Option (A) is correct
**Explanation:** Assertion is true. Habitat fragmentation breaks large, continuous habitats into smaller, isolated patches, making it difficult for species to survive and leading to a loss of biodiversity.
Reason is also true. Fragmentation reduces gene flow between populations, leading to inbreeding and reduced adaptability. It also increases the edge effect, where altered conditions at the boundaries of habitats make them less suitable for many native species.
4. Option (A) is correct
**Explanation:** Assertion is true. Sacred groves are patches of forest traditionally protected by local communities. They support in-situ conservation by allowing native plants, animals, and microbes to thrive in their natural habitat.
Reason is also true. These groves are often protected due to religious or cultural beliefs, which helps prevent human disturbance. As a result, they act as refuges for many rare and endemic species.
5. Option (D) is correct
**Explanation:** Assertion is false. Ex-situ conservation is not always better than in-situ conservation. While ex-situ methods (like zoos, botanical gardens, seed banks) are useful for critically endangered species, in-situ conservation (protecting species in their natural habitats) is more effective for maintaining ecological interactions and natural evolution.
Reason is true. Ex-situ methods do involve preserving species outside their natural habitat, such as in zoos, aquaria, botanical gardens, and gene banks.
6. Option (D) is correct
**Explanation:** Assertion is false. Endangered species do not have stable populations. They are classified as endangered because their numbers have declined drastically in the wild and they are at high risk of extinction.
Reason is true. Species become endangered mainly due to habitat destruction, poaching, climate change, and pollution, which threaten their survival.

## VERY SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. Urban green spaces like biodiversity parks support conservation by:
(1) Preserving native flora and fauna within city limits, acting as in-situ conservation sites.
(2) Providing ecosystem services such as air purification, temperature regulation, groundwater recharge, and noise reduction.
They also improve human well-being by:
(1) Offering recreational and educational opportunities.
(2) Reducing stress and enhancing mental and physical health through natural interaction.
2. Preserving hedgerows and native trees in organic farming:
(1) Supports biodiversity by providing habitats and corridors for birds, insects (like pollinators), and other beneficial organisms.
(2) Enhances ecosystem stability by maintaining natural pest control, improving soil fertility, and preventing soil erosion.
3. Community reserves and sacred groves are important for in-situ conservation because:
(1) They protect native species in their natural habitats, including many rare, endemic, and medicinal plants.
(2) They are preserved by local communities through traditional beliefs and customs, ensuring long-term conservation without formal enforcement.
4. Habitat fragmentation caused by highways and dams:
(1) Disrupts wildlife movement and breeding, leading to isolated populations and reduced genetic diversity.

(2) Increases the edge effect, making habitats more vulnerable to invasive species, climate changes, and human interference.

**5.** Conserving biodiversity is vital for medical and economic development because:

(1) Tropical forests are a rich source of bioactive compounds used in developing medicines (e.g., antibiotics, anticancer drugs).

(2) Preserving diverse species ensures a continuous supply of novel genetic resources, supporting medical discoveries and boosting the economy through *bioprospecting*.

## SHORT ANSWER TYPE QUESTIONS (3 Marks)

**1.** Unregulated tourism can negatively impact biodiversity in the following ways:

(1) **Habitat Destruction:** Construction of hotels, roads, and recreational facilities leads to deforestation and fragmentation of natural habitats.

(2) **Pollution:** Increased littering, plastic waste, sewage discharge, and noise pollution degrade ecosystems and threaten sensitive species.

(3) **Disturbance to Wildlife:** Frequent human presence disrupts animal breeding, feeding, and migration, leading to population decline or forced relocation.

**2.** Plastic waste harms marine biodiversity in the following ways:

(1) **Ingestion and entanglement:** Marine animals like turtles, fish, and seabirds often mistake plastics for food or get entangled, leading to injury, starvation, or death.

(2) **Toxicity:** Plastics break down into micro-plastics that release harmful chemicals, which enter the food chain and affect aquatic life and human health.

(3) **Habitat degradation:** Accumulation of plastic disrupts coastal and marine habitats, such as coral reefs and mangroves, affecting the entire marine ecosystem.

Banning single-use plastics helps prevent further pollution, supports marine conservation, and promotes sustainable environmental practices.

**3.** Sacred groves are patches of forest protected by local communities due to religious and cultural beliefs. They are among the oldest forms of in-situ conservation in India.

The ecological benefits offered by sacred groves are:

(1) Biodiversity hotspots: Sacred groves preserve rare, endemic, and medicinal species of plants and animals, supporting local biodiversity.

(2) Ecological services: They help in soil and water conservation, maintain microclimate, and serve as gene banks for native species.

**4.** Deforestation leads to loss of habitat, fragmentation, and disruption of food chains, causing a decline in species richness and extinction of vulnerable species.

Two real-world examples are:

(1) Western Ghats (India): Large-scale clearing for plantations and urban expansion has endangered species like the Lion-tailed macaque by shrinking its habitat.

(2) Amazon Rainforest (South America): Massive deforestation for cattle ranching and soy cultivation threatens countless species, including the Harpy eagle and various orchids, some of which are yet to be discovered.

**5.** A biodiversity hotspot is a region that:

(1) Has exceptionally high species richness, especially endemic species (found nowhere else).

(2) Has lost at least 70% of its original natural vegetation due to human activities.

Urgent conservation is needed because these areas are ecologically fragile and rich in unique life forms that are at high risk of extinction. Loss of such biodiversity can lead to collapse of ecosystem services like pollination, water purification, and climate regulation.

## CASE BASED QUESTIONS (4 Mark)

**1.** **(i)** Option (B) is correct.
**Explanation:** While both regions may have the same number of species (species richness), biodiversity also takes into account the evenness of species distribution. If Region Y has a more even distribution of individuals across different species compared to Region X, then Region Y will be considered more diverse despite having the same species richness as Region X.

**(ii)** Option (A) is correct.
**Explanation:** Biodiversity is not only determined by species richness but also by the evenness of species distribution. Region Y's more balanced distribution makes it more diverse.

**(iii)** Option (A) is correct.
**Explanation:** If one or a few species dominate the region, the diversity index decreases, making the region less diverse.

**(iv)** Option (B) is correct.
**Explanation:** An increase in species richness in Region Y will enhance its biodiversity, especially if the newly discovered species adds to an already even distribution.

**2.** **(i)** **(a)** This region is less seasonal with constant and more predictable environment / More solar energy so higher productivity and higher diversity. It represent tropical lattitudes which remain relatively undisturbed for millions of years and had a long evolutionary time for species diversification.

**OR**

**(b)** Region I represent temperate region subjected to frequent glaciation and get lesser evolutionary time for species diversification / has more seasonal with less constant and less predictable environment which lead to lower specie diversification / have lower solar energy available which reduces productivity and inturn contributes to lesser diversity.

**(ii)** Latitudinal gradient in diversity.

**(iii)** Conventional taxonomic methods are not suitable for identifying microbial species, and many species are not culturable under laboratory conditions.

**3. (i) (a)** To conserve organisms for their economic cultural scientific and recreational value / to conserve biological diversity of wetlands.
It was named after the city 'Ramsar' in Iran.

**OR**

**(b)** (I) marshes, lakes, coral reefs, wetlands etc. **(Any two)**

(II) Ashtamudi wetland (Kerela), Bhitarkanika Manaroues (Orissa), Bhojcutland (Madhya Pradesh), Chandra Taal (Himachal Pradesh) or any other site. **(Any two)**

**(ii)** Haiderpur wetland.

**(iii)** Australia

**4. (i)** Species diversity decreases as we move from region A to region B.

**Reasons:** Less Constant mean annual temperature, lesser habitable land area, availability of lesser solar energy, lesser productivity or any other correct reason in 'B' region. **(Any two)**

**(ii) (a)** More the 1200 species of birds, Indian land mass being largely in the tropical latitudes.

**OR**

**(b)** Amazonian rainforest (in South America), mainly being in tropical region.

**5. (i) (a)** Biodiversity increases as we move from arctic towards tropics/biodiversity decreases as we move from tropics towards arctic.

**OR**

**(b)** X - Columbia
Y - India / South America

**(ii) Tropics harbor more biological diversity:**

(1) Speciation is generally a function of time unlike temperate regions subjected to frequent glaciation in the past tropical latitudes have remained relatively undisturbed for millions of years and thus had a long evolutionary time for species diversification.

(2) Tropical environments are less seasonal relatively more constant and predicatable which promote niche specialisation and lead to a greater species diversity.

(3) There is more solar energy available in the tropics which contributes to higher productivity that contributes indirectly to greater diversity.

## LONG ANSWER TYPE QUESTIONS (5 Marks)

**1. (i)** Biodiversity refers to the variety of life forms on Earth, including different plants, animals, microorganisms, and the ecosystems they form.

It is studied at three levels:

(1) **Genetic diversity:** Variation of genes within a species (e.g., different rice or mango varieties).

(2) **Species diversity:** Variety of species within a region or ecosystem (e.g., tigers, deer, and elephants in a forest).

(3) **Ecosystem diversity:** Variety of habitats and ecological processes (e.g., deserts, forests, wetlands).

**(ii)** The impact of monoculture on biodiversity and ecosystem health are:

(1) Monoculture (growing a single crop or species over a large area) reduces species diversity and destroys habitats for native flora and fauna.

(2) It makes ecosystems vulnerable to pests, diseases, and climate change, as there is little genetic or species variation to provide resilience.

(3) It leads to soil degradation, water depletion, and a loss of natural ecological balance.

**(ii)** The sustainable alternatives to monoculture are:

(1) **Agroforestry:** Growing trees alongside crops to enhance biodiversity and soil fertility.

(2) Mixed cropping or polyculture: Cultivating multiple crops together to promote ecological balance and pest control.

**2. (i)** Sustainable development is a strategy that meets the needs of the present without compromising the ability of future generations to meet their own needs.

In biodiversity-rich areas, it is important because:

(1) It ensures that natural resources are used wisely without depleting them.

(2) It helps protect ecosystems and endangered species while still supporting human livelihoods.

**(ii)** Eco-tourism provides economic benefits to local communities while encouraging protection of wildlife and habitats. Community-based conservation involves locals in decision-making and resource management, promoting a sense of ownership and reducing unsustainable exploitation. These approaches balance livelihood security with biodiversity protection.

**(iii)** The measures to reduce human-wildlife conflict are:

(1) Fencing or buffer zones around human settlements and farms.

(2) Early warning systems and community awareness programs to prevent wildlife encounters.

3. (i) India is considered a mega-diverse country because:

(1) It has a wide variety of ecosystems, including forests, wetlands, mountains, deserts, and coastal areas.

(2) It supports over 90,000 animal species and 45,000 plant species, with many being endemic (found only in India).

(3) It has four biodiversity hotspots: the Himalayas, Indo-Burma region, Western Ghats–Sri Lanka, and Sundaland (Nicobar Islands).

(4) India's climatic diversity and cultural traditions of conservation also contribute to its status.

(ii) Two in-situ and two ex-situ conservation strategies used in India are:

In-situ conservation (within natural habitat):

(1) National Parks – e.g., Kaziranga National Park protects the one-horned rhinoceros.

(2) Biosphere Reserves – e.g., Nilgiri Biosphere Reserve conserves a range of flora and fauna in their natural habitat.

Ex-situ conservation (outside natural habitat):

(1) Botanical Gardens – e.g., Indian Botanical Garden, Kolkata conserves rare plant species.

(2) Seed banks – e.g., National Bureau of Plant Genetic Resources (NBPGR) stores seeds of endangered and crop species.

(iii) Endemic species are found only in specific regions, and their extinction means a total global loss. Endangered species are on the verge of extinction; protecting them helps maintain ecological balance, genetic diversity, and ecosystem services. Their conservation is essential for sustainable development and future resource security.

4. (i) (1) Loss of biodiversity, especially of pollinators, soil organisms, and pest predators, directly reduces crop yields and quality.

(2) It weakens the resilience of agro-ecosystems, making crops more vulnerable to pests, diseases, and climate change, thereby threatening long-term food security.

(ii) Pollinators like bees, butterflies, and some birds and bats transfer pollen from one flower to another, enabling fertilisation and seed production. They are essential for the reproduction of over 75% of flowering plants and many fruit, vegetable, and oilseed crops. Without pollinators, agricultural biodiversity and productivity would decline sharply.

(iii) Two sustainable farming practices that support pollinator conservation are:

(1) Organic farming: Avoids chemical pesticides and fertilisers, protecting pollinator health.

(2) Planting flowering hedgerows or native vegetation: Provides food and shelter for pollinators year-round.

5. (i) (1) Mangroves provide breeding and nursery grounds for a wide variety of marine life such as fish, crabs, shrimps, and mollusks.

(2) Their complex root systems offer shelter and protection to juvenile aquatic species and support rich food webs.

(3) They also host unique terrestrial and avian species, contributing to high biodiversity in coastal ecosystems.

(ii) The consequences of mangrove destruction are:

(1) Loss of marine biodiversity: Decline in fish populations affects local fisheries and marine food chains.

(2) Coastal vulnerability: Without mangroves, coasts become prone to erosion, storm surges, and tsunamis, putting local communities at risk.

(3) Livelihood loss: Fisherfolk and aquaculture-dependent communities lose income and resources due to declining marine life.

(iii) Two eco-friendly strategies to conserve and restore mangroves are:

(1) Community-based mangrove plantation using native species and involving local stakeholders.

(2) Restricting land reclamation and unsustainable aquaculture near mangrove belts through zoning and strict coastal regulation.