

## Chapter 10.4

# Biodiversity and Conservation

## Biodiversity

The term 'biodiversity' refers to 'the variety and variability among living organisms and the ecological complexes in which they occur'. If you observe a patch of forest, you may find a wide variety of plant and animal life. The plant life may range from a small herb to a large tree, and animal life may vary from a tiny insect to a large mammal. Apart from plants and animals, numerous microorganisms, which cannot be seen with naked eyes also occur in the soil. This shows biological diversity or biodiversity of a forest patch. Thus, biodiversity can be defined as '*the totality of genes, species and ecosystem of a region*'.

Biodiversity differs from place to place as each habitat has its distinct biota. However, many biologically rich and unique habitats are being destroyed, degraded and fragmented.

The major factors that tend to decrease biodiversity are increasing human population, higher resource consumption and pollution. Loss of biodiversity reduces gene pool of species, number of interactions in the biota and ability of species to adapt themselves to changes in the environment. It not only checks evolutionary advancements but also put the surviving species to dangers of extinction.

(1) **Magnitude of biodiversity** : Biologists are engaged in the identification and naming of species for the last 250 years. Still, they are able to name and describe far less number of species than the actual number present. Presently, the known and described number of species of all organisms on the earth is between 1.7 and 1.8 million, which is fewer than 15% of the actual number. It is predicted that the number of total species varies from 5 to 50 million. Approximately 61% of the known species are insects. About 2,70,000 species of plants and only 4650 species of mammals are known to science. Only fragmentary information is available about bacteria, viruses, protists and Archaea. The major area where numerous species are believed to be unknown to science are tropics and coral reefs.

Presently, efforts are being made to discover and describe new species more rapidly. The projects like '*Global Biodiversity Information Facility and the Species 2000*', are attempting to discover new species faster than ever before.

(2) **Levels of biodiversity** : The biological diversity include three interrelated hierarchical levels, viz. Genetic diversity, Species diversity and Community and ecosystem diversity.

(i) **Genetic diversity** : It is the diversity in the number and types of genes as well as chromosomes present in different species and the variations in the genes and their alleles in the same species. For instance, the number of genes is about 450-700 in *Mycoplasma*, 4000 in *Escherichia coli*, 13000 in *Drosophila melanogaster*, 32000-50000 in *Oryza sativa* and 35000 to 45000 in *Homo sapiens*.

'The genetic variation existing within a species is called genetic diversity'. The genetic variation may be in alleles (different variants of same genes), in entire genes (the traits determining particular characteristics) or in chromosomal structures.

Genetic diversity is useful in adaptation to changes in environmental conditions. It helps in speciation or evolution of new species.

(ii) **Species diversity** : It is the variety in the number and richness of the species of a region. The number of species per unit area is called species richness. Number of individuals of different species represent species evenness or species equitability. Communities where species are represented by more or less equal number of individuals exhibit evenness. Others where one or more species have more individuals than others show dominance or unevenness. Species diversity is product of both species richness or evenness or equitability, i.e., species richness is weighed by species evenness.

(iii) **Community and ecosystem diversity** : Community diversity refers to the variations in the biological communities in which species live. There are three perspectives of diversity at the level of community. These are alpha diversity, beta diversity and gamma diversity.

(a) **Alpha diversity** ( $\alpha$ -index Diversity, Within-Community Diversity) : It indicates diversity within the community. It refers to the diversity of organisms sharing the same community or habitat. A combination of species richness and equitability/evenness is used to represent diversity within a community or habitats.

(b) **Beta diversity** ( $\beta$ -index Diversity, Between-Community Diversity) : It is biodiversity which appears in a range of communities due to replacement of species with the change in community/habitat due to presence of different microhabitats, niches and difference in environmental conditions. It is the rate of replacement of species along a gradient of habitats.

(c) **Gamma diversity** ( $\gamma$ -index Diversity) : It refers to the diversity of the habitats over the total land scape or geographical area.

(3) **Gradients of biodiversity** : Biodiversity is not uniform on the earth. It varies with change in latitude or altitude. Biodiversity increase, when we move from high to low latitude (i.e. from the poles to the equator). The temperate region has severe climate with short growing period for plants. On the other hand tropical region has favourable conditions for the growth throughout the year. The favourable environmental conditions favour speciation (i.e. origin of new species) and make it possible for a larger number of species to occur and grow. Therefore, tropical regions are rich in biodiversity.

Similarly, the species diversity decreases from lower to higher altitude on a mountain. The temperature drops about 6.5°C with increase in altitude by 1000 m. The drop in temperature and greater seasonal variability at higher altitudes are the two major factors that reduce diversity.

It should not be confused with complexity and heterogeneity of the physical environment which tends to increase complexity and diversity of flora and fauna of an area.

(4) **Benefits of biodiversity** : Biodiversity provides numerous direct and indirect services to human beings, e.g., :

(i) Diversity of plants and animals provide a vast variety of foods and fabrics.

(ii) Maintenance of ecological balance or ecosystems stability.

(iii) Preserving biodiversity provides economic benefits which include improving the desirable characteristics of crops, making plants more pest resistant, providing medicines to treat and cure illness, supporting ecotourism and providing enjoyment to individuals.

(iv) Biodiversity enriches the lives of people in industrialized world and developed countries and provides the means of survival to people in developing countries.

## (5) Threats to biodiversity

(i) **Destruction of habitats** : Destruction of natural habitat is the primary threat to the biodiversity. Natural habitats, which protect natural flora and fauna are being converted to human settlements, harbours, dams, reservoirs, crop-lands, grazing grounds and mining sites. Deforestation deprive animal life of shelter and food. This decreases the population of many species. Migratory animals are also affected by deforestation because of the disturbance in their routes. Some of the dams are blocking, spawning and migration of fishes by inundating the habitats and by changing the physical environment. Sometimes human cleanliness destroys the habitat of scavengers such as vultures, kites, etc. The California condor (*Cathartes californianus*) a sky scavenger, which is the largest flying bird of today, has been severely affected by human cleanliness.

(ii) **Disturbance and degradation of habitats** : They are of two types, natural and man-made. Natural disturbance and degradation are caused by spontaneous jungle fire, pest infestation, defoliation by insects, locust attack, etc. Man-made disturbance and degradation are more severe. They include felling of trees, use of fire for clearing forest areas, collection of litter, and over-exploitation for other economically important products. Disturbance and degradation result in loss of biodiversity.

(iii) **Pollution** : The most subtle form of habitat degradation is environmental pollution. Pollution may reduce and eliminate populations of sensitive species. The populations of fish eating birds and falcons have declined due to excessive use of pesticides in crop fields. Lead poisoning is another major cause of mortality of many aquatic birds like ducks, swans and cranes. These birds often swallow the spent shotgun pellets that fall into lakes and marshes. The nutrient enrichments (eutrophication) also drastically reduce biodiversity.

(iv) **Introduction of exotic species** : New species entering a geographical region are called exotic or alien species. Introduction of exotic species may cause significant loss to the biological communities. The great majority of the exotic species do not become established in the introduced new places. However, some of the species are able to establish in new area. Such successful exotic species may kill or eat native species to the point of extinction, or may so alter the habitat that many natives are no longer able to persist. Island ecosystems are most vulnerable due to small size and small number of species.

A few examples of introduction of exotic species and their effects are : (a) Introduction of Nile perch (an exotic predatory fish) into lake Victoria (South Africa) threatened the entire ecosystem of the lake by eliminating several native species of the small Cichlid fish species that were endemic to this fresh water ecosystem. (b) In several tropical countries including India, water hyacinth (A free floating exotic water weed) clogs rivers and lakes, and threatens the survival of many aquatic species in lakes and rivers. (c) *Lantana camara* (An exotic shrub) strongly competes with the native species and eliminate many of them. The exotic shrub has invaded many forests in different parts of our country.



(6) **Extinction of species** : The most serious aspect of the loss of biodiversity is the extinction of species. Once a species goes extinct, its chances for further evolution are lost. A species is considered extinct, when no member of the species remains alive anywhere in the world. If individuals of a species remain alive only in captivity or other human-controlled conditions, the species is said to be extinct in the wild. In both of these situations, the species would be considered globally extinct.

A species is considered to be ecologically extinct, if it persists at such reduced numbers that its effects on other species in its community are negligible. Extinction is a natural process.

**Types of extinction** : Species become extinct through three types of extinction processes.

(i) **Natural extinction** : It is the extinction of species slowly from the earth due to change in environmental conditions. Some species disappear and the others which are more adapted to changed conditions, take their place. Many species have lost in the geological past by natural extinction. The extinction of species in the geological past is also called background extinction.

(ii) **Mass extinction** : It refers to the extinction of large number of species due to catastrophe. There have been several periods in the earth's geological history, when large number of species became extinct because of catastrophes. Mass extinction occurred in millions of years.

(iii) **Anthropogenic extinction** : They are extinctions abetted by human activities like settlements, hunting, over exploitation and habitat destruction. The World Conservation Monitoring Centre has found out that since 1600 A.D., the earth has lost 533 animal species (mostly vertebrates) and 384 plant species (mostly flowering plants). 75% of these extinctions are caused by direct human interference. It is almost documented that Dodo (*Raphus cucullatus*) and Tasmania Wolf (*Thylacinus cynocephalus*) have been hunted to extinction by humans.

(7) **Susceptibility of extinction** : All species are not equally susceptible to extinction. The characteristics which make a species susceptible to extinction are listed below

- (i) Large body size e.g. Bengal tiger, lion and elephant.
- (ii) Small population size and low reproductive rate e.g. Blue whale and Giant Panda.
- (iii) Feeding at high tropic levels in the food chain e.g. Bengal tiger and Bald eagle.
- (iv) Fixed migratory routes and habit. e.g. Blue whale and whooping crane.
- (v) Localized and narrow range of distribution. e.g. Woodland caribou and Island species.

(8) **Red data book and IUCN** : IUCN is International Union of Conservation of Nature and Natural Resources which is now called World Conservation Union (WCU). It has its headquarters at Morges, Switzerland. It maintains a red data book or red list which is a catalogue of taxa facing risk of extinction. Threatened species is the one which is liable to become extinct if not allowed to realise its full biotic potential by providing protection from exotic species/human exploitation/habitat deterioration/depletion of food. Red data book or red list was initiated in 1963.

Table : 10.4-1 Red list has eight categories

SN	Red list category	Definition
(1)	<b>Extinct</b>	A taxon is Extinct when there is no reasonable doubt that the last individual has died. e.g. Dodo.
(2)	<b>Extinct in the wild</b>	A taxon is Extinct in the wild when exhaustive surveys in known and/or expected habitats, have failed to record an individual.
(3)	<b>Critically endangered</b>	A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future. e.g. <i>Sus salvanius</i> (Pigmy hog) <i>Berberis nilghiriensis</i> .
(4)	<b>Endangered</b>	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future. e.g. <i>Ailurus fulgens</i> (Red panda), Blue whale, Largest Lemur Idri-Idri of Madagascar, <i>Nepenthes</i> , <i>Khasiana</i> , Asiatic lion, <i>Drosera</i> , <i>indica</i> etc.
(5)	<b>Vulnerable</b>	A taxon is Vulnerable when it is not Critically Endangered or Endangered, but is facing a high risk of extinction in the wild in the medium-term future. e.g. <i>Antelope cervicapra</i> (Black Buck).
(6)	<b>Lower risk</b>	A taxon is Lower Risk when it has been evaluated and does not satisfy the criteria for Critically Endangered, Endangered or Vulnerable.
(7)	<b>Data deficient</b>	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.
(8)	<b>Not evaluated</b>	A taxon is Not Evaluated when it has not yet been assessed.

Out of these, four categories of species are included threatened species - critically endangered, endangered, vulnerable and lower risk species. Two more categories are also added to them. They are **Rare Species (R)** : They are species with naturally small population, either localised or thinly scattered, which are always at risk from pests/pathogens/predators/exotic species. Clouded Leopard (*Neofelis nebulosa*). Hawaiian Monk Seal (*Monachus schauinslandii*). Great Indian Bustard (*Ardeotis nigriceps*). (ii) **Indeterminate Species** : The species are in danger of extinction but the reason is not known, e.g., 3-banded Armadillo of Brazil, Short Eared Rabbit of Sumatra, Mexican Prairie Dog.

The main objectives of Red lists are listed below :

- (i) Identification and documentation of endangered species.
- (ii) Providing a global index of the decline of biodiversity.
- (iii) Developing awareness about the importance of threatened biodiversity.
- (iv) Defining conservation priorities at the local level and guiding conservation action.

(9) **Conservation of biodiversity** : Conservation of biodiversity is protection, uplift and scientific management of biodiversity so as to maintain it at its optimum level and derive sustainable benefit for the present as well as future strategies.

**Conservation strategies** : There are two basic strategies of biodiversity conservation – *in-situ* (on site) and *ex-situ* (off site).

(i) **In-situ conservation** : It is protection and management of important components of biological diversity through a network of protected areas.

(a) **Protected areas** : They are ecological/biogeographical areas where biological diversity along with natural and cultural resources are protected, maintained and managed through legal or other effective measures. National Parks and Wildlife Sanctuaries are the examples of protected areas. The World Conservation Monitoring Centre (WCMC) has recognised 37,000 protected areas around the world. As of September 2002, India has 581 protected areas (89 National parks and 492 Wildlife Sanctuaries). These areas cover 4.7 per cent of the land surface as against 10 per cent internationally suggested norm. The protected areas provide following benefits.

□ **Maintain viable populations of all native species and sub-species.**

□ **Maintain the number and distribution of communities and habitats, and conserve the genetic diversity of all the present species.**

□ **Prevent man made introduction of alien species.**

□ **Make it possible for species/habitats to shift in response to environmental changes.**

(b) **Biosphere** : All the thousands of ecosystems together constitute the biosphere, which exists as a thin envelope around the earth's surface. The global environment consists of three main sub divisions :

(1) **Hydrosphere** : All the water (liquid) component of the oceans, seas, rivers and other island water bodies.

(2) **Lithosphere** : The solid components of the earth crust, rocks, soil and minerals.

(3) **Atmosphere** : The gaseous cover which envelops the hydrosphere and the lithosphere is the atmosphere. The entire inhabited part of the earth and its atmosphere (including the living and the non-living components) forms the biosphere.

As a result of manipulation by man, the biosphere has become transformed into a human dominated environment of noosphere (*noo* = mind).

**Role of atmosphere in metabolism** : Of much greater significance to metabolism, however, are the biogeochemical cycles of the atmosphere. The air consists mainly of oxygen (20.95 per cent), carbon dioxide (about 0.03 per cent), nitrogen (78.08 per cent), water vapour and minute traces of inert gases. Except the inert gases, all these components of air serve as metabolites; each circulates through a cycle in which the organisms play an important role. As all gases are dissolved in natural waters, the hydrosphere maintains an equilibrium with the atmosphere.

**Biosphere reserves** : The Man and Biosphere (MAB) programme of UNESCO formulated the concept of Biosphere in 1971, which deals with conservation of ecosystems and genetic resources contained therein. *"The Biosphere Reserves are a special category of protected areas of land/or coastal environments, wherein people are an integral component of the system"*. These are representative examples of natural biomes and contain unique biological communities.

**A biosphere reserve has three zones :**

□ **Core or natural zone** : It comprises an undisturbed and legally protected ecosystem.

□ **Buffer zone** : It surrounds the core area, and is managed to accommodate a greater variety of resource use strategies, and research and educational activities.

□ **Transitional zone or manipulation zone** : It is the outermost part of the biosphere reserve. It serves as an area of active cooperation between reserve management and the local people, wherein activities like settlements, cropping, forestry and recreation and other economic uses continue in harmony with conservation goals.

#### **Importance of biosphere reserve**

**Restoration** : Biosphere reserves help in restoration of degraded ecosystems and habitats.

**Conservation** : Biosphere reserves ensure the conservation of landscapes, ecosystems, species and genetic resources. These reserves also encourage the traditional resource use.

**Development** : The biosphere reserves promote culturally, socially and ecologically sustainable economic development.

**Scientific research, monitoring and education** : The biosphere reserves provide support for research monitoring, education and information exchange related to local, national and global issues of conservation and development.

(c) **Sacred forests and sacred lakes** : Sacred forests are forest patches around places of worship which are held in high esteem by tribal communities. They are the most undisturbed forest patches (Island of pristine forests) which are often surrounded by highly degraded landscapes. They are found in several parts of India, e.g., Karnataka, Maharashtra, Kerala, Meghalaya. Temples built by tribals are found surrounded by Deodar forests in Kumaon region, Jaintias and Khasias in Meghalaya. Not a single branch is allowed to be cut from these forests. As a result many endemic species which are rare or have become extinct elsewhere can be seen to flourish here. Similarly aquatic flora and fauna is also protected in sacred water bodies. e.g. Khaheopalri lake in Sikkim.

(ii) **Ex-situ conservation** : It is conservation of selected rare plants/animals in places outside their natural homes. *Ex situ* conservation includes offsite collections and gene banks.

(a) **Offsite collections** : They are live collections of wild and domesticated species in botanical gardens, zoos, arboreta, etc. Currently, there are more than 1500 botanical gardens and arboreta (Gardens with trees and shrubs) having more than 80,000 species. Many of them have seed banks, tissue culture facilities and other *ex-situ* technologies. The number of zoos/zoological parks is more than 800. They have about 3000 species of mammals, birds, reptiles and amphibians. Most of them have well managed captive breeding programmes.

Therefore, offsite collections can be used to restock depleted populations, reintroduce species in the wild and restore degraded habitats.

(b) **Gene banks** : A gene bank or germ plasm bank is an institution where valuable plant material is preserved in a viable condition. These are stored either in the form of seeds or dormant vegetative organs or in the form of frozen gametes.

□ **Seed banks** : Plant germplasm in live state is the viable seed. In a seed the embryo is present in a dormant state. The moisture contents of seeds is kept low (5-15%) and they are stored at low temperature (-10°C to -20°C) with supply of little oxygen. With these conditions there is reduced enzyme activity and reduced respiration. From time to time at definite intervals these seeds are



sown to produce new plants and fresh seeds are obtained. Such seeds are called Orthodox seeds as they can withstand the reduction in moisture and prolonged exposure to low temperature. Seeds of trees and shrubs usually get killed on drying and freezing. Such seeds are called Recalcitrant seeds e.g., tea, litchi. In such cases plants are kept in orchards and maintained through *in-situ* conservation.

❑ **Orchards** : Plants with recalcitrant seeds are grown in orchards where all possible strains and varieties are maintained, e.g., litchi, Palm oil, rubber tree, etc.

❑ **Tissue Culture** : It is carried out through callus formation, embryoids, pollen grain culture and shoot tip culture for those plants which are either seedless, have recalcitrant seeds, variable seed progeny or where clone is to be maintained. The method is useful in maintaining a large number of genotypes in small area, rapid multiplication of even endangered species and for hybrid rescue. Shoot tip culture maintains virus free plants. It is used for international exchange of germplasm in vegetatively multiplied cultivars, e.g., banana, potato.

❑ **Cryopreservation** : Preservation at  $-196^{\circ}\text{C}$  (liquid nitrogen) can maintain tissue culture, embryos, animal cells/tissues, spermatozoa indefinitely. The cryopreserved material is revived through special technique when required.

(10) **Hot spots of biodiversity** : They are the areas with high density of biodiversity or megadiversity which are also the most threatened ones. To designate priority areas for *in situ* conservation, Norman Myers developed the 'hot spots' concept in 1988. 'The hot spots are the richest and the most threatened reservoirs of plant and animal life on earth'.

Ecologically hot spots are determined by four factors. (i) Number of species/species diversity. (ii) Degree of endemism. (iii) Degree of threat to habitat due to its degradation and fragmentation. (iv) Degree of exploitation.

Over the world 25 terrestrial hot spots have been identified for the conservation of biodiversity. Out of these 15 hot spots have tropical forests, 5 occur in Mediterranean-type zones and 9 hot spots are present in tropics. The hot spots together occupy 1.4 per cent of the earth's land area. About 20 per cent of the human population lives in the hot spots.

**Hot spots in India** : Out of the 25 hot spots of the world, two are found in India. These are Western Ghats and Eastern Himalayas, and these extend to the neighbouring countries also. These areas show high degree of endemism and are inhabited by a wide variety of flowering plants, swallow tailed butterflies, amphibians, reptiles and mammals.

(i) **Western Ghats** : It lies parallel to the Western Coast of Indian peninsula for almost 1600 km, spread over in Maharashtra, Karnataka, Tamil Nadu and Kerala. The evergreen forests are found at low elevation (i.e. 500 m above mean sea level), whereas semi-evergreen forests occur at 500-1500 m height. The two main centres of biological diversity are : (i) the Agasthyamalai hills and Silent valley and (ii) the new Amambalam Reserve.

(ii) **Eastern Himalaya** : It extends to the north eastern India and Bhutan. Many deep and semi isolated valleys are found in this

region. These valleys are exceptionally rich in endemic plant species. There occur temperate forests at altitudes of 1780 to 3500 m in this region. The eastern Himalaya is an active centre of evolution and exhibits a rich diversity of flowering plants. Numerous primitive angiosperm families (e.g., Magnoliaceae and Winteraceae) and primitive genera of plants like *Magnolia* and *Betula* and found in this region.

(11) **International efforts for conserving biodiversity** : Earth summit of Rio de Janeiro (1992), Brazil, promoted Convention of Biological Diversity (CBD) which was signed by 152 nations. Its recommendations came into effect on 29<sup>th</sup> Dec. 1993. India became a party to this Convention on Biological Diversity in May, 1994.

The convention has three key objectives

- (i) Conservation of biological diversity
- (ii) Sustainable use of biodiversity
- (iii) Fair and equitable sharing of benefits arising out of the utilization of genetic resources.

A number of projects for the conservation and appropriate development of Biosphere Reserves, are being supported by the World Conservation Union and the World Wide Fund for Nature (WWF).

(12) **Biodiversity conservation in India** : India is a centre of rich biological diversity and has contributed significantly to the global biodiversity.

India is a home land of 167 cultivated species and 320 wild relatives of crop plants. It is a centre of diversity of animal species (e.g. zebu, mithun, chicken, water buffalo, camel); crop plants (e.g. edible diascoras, alocasia, colocasia); species and condiments (e.g., cardamom, black pepper, ginger, turmeric), bamboos, brassicas and tree cotton. India also represents a secondary centre of domestication for some animals (e.g. horse, goat, sheep, cattle, yak and donkey) and plants (e.g. tobacco, potato and maize).

Because of the abundant diversity present in the country, its conservation is very important not only for the country but also for the rest of the world. Both *in situ* and *ex situ* conservation measures are being undertaken.

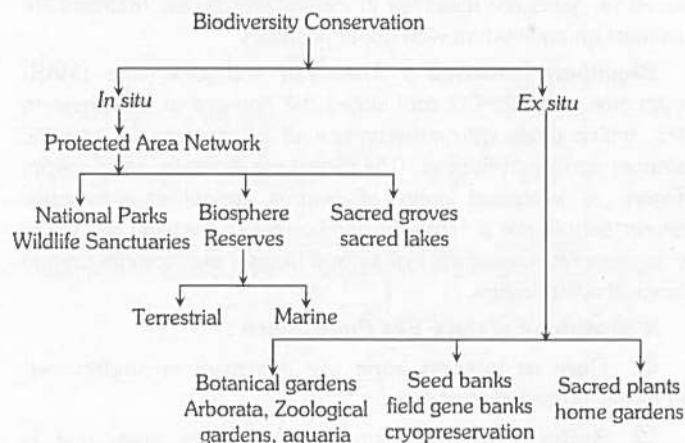


Fig : 10.4-1 The *in situ* and *ex situ* approaches of conserving biodiversity in India

The National parks, Wildlife sanctuaries and other protected areas maintained by the Ministry of Environment and Forests provide *in situ* conservation of biodiversity. The joint forest management systems involve forest departments and local communities to enable tribal and local people to have access to non-wood forest products (such as lac, silk, honey, wax, tendu leaves, etc.) and at the same time protect the forest resources.

Major *ex situ* conservation of biodiversity is being managed by National Bureau of Plant, Animal and Fish Genetic Resources. There is an International Crop Research Institute for Semi-Arid Tropics (ICRISAT) in Hyderabad for conserving germplasm of Groundnut, Pigeon Pea, Chick Pea, Pearl Millet and Sorghum. A number of other centres in India are maintaining hundred and thousands of present and past varieties of crop plants. Thus germplasms of plants and animals are being conserved *in vitro* in gene/seed banks, field gene banks, botanical gardens and zoological gardens. Being spread over different parts of the country, the various institutes are conserving regional variants of all types of important plants and animals.

### Wild life conservation

Wild animal means any non-domesticated animal found wild in nature. It includes both vertebrates (fish, amphibians, reptiles, birds and mammals) and invertebrates (bees, butterflies, moths, crustaceans, etc.) the term "wild life" includes animals as well as plants, which form part of any habitat in nature. Some wild animals are so characteristic that they become symbols of their home countries. Thus, tiger is associated with India, white bear with Russia, Giant Panda with China, kangaroo with Australia, kiwi with New Zealand and springbok with South Africa.

**(1) Importance (Values) of Wild Life :** Wild life is a source of danger to human life. It is a nuisance to a farmer because it often destroys his crops. The domestic livestock is denied grazing ground in sanctuaries and reserves for wild life. Similarly, the hunters are denied recreation by shooting wild life. Even then conservation of wild life becomes necessary and of great importance due to its many values to mankind.

**(i) Ecological value :** For a millennium, man and wild animals have evolved together on this planet, called Earth. All life on earth is one and all living things are inextricably interlinked (food chains) forming ecosystems. Destruction of wild life may cause upset in the ecological balance or equilibrium resulting in severe consequences. Thus, protection of every animal species is of great importance to the quality of life and to the survival of man himself. By rendering the planet uninhabitable for animals, we will not be able to avoid extinction ourselves.

**(ii) Commercial value :** Wild life forms an important natural resource. Unlike coal or petroleum which is nonrenewable, wild life is a renewable resource. With proper care and management, it can yield good dividends and even earn foreign exchange. The commercial value of wild life is best seen in the world's marine fisheries, with an annual output of about 100 million tons of sea food worth billions of rupees.

Freshwater fish and other aquatic creatures also provide large amount of food for people. Wild life of dry land mainly contributes to the food of the so-called primitive people of the world. An entire industry, the fur trade is supported by fur-bearing animals. Trade in live as well as dead animals supports thousands of people and also earns foreign exchange.

For example, an Indian rhino may fetch equivalent of Rs. 1,25,000 in the world market. Similarly, the ivory of elephants, the horns of rhinoceros, the glands of musk deer, the antlers of deer etc., all command high prices. Wild life of a country may even attract people from abroad and earn foreign exchange. Thus, the tourist industry of Kenya (East Africa), based on its wild life, ranks third after coffee and sisal.

**(iii) Game value :** Wild life has its worth as game also. In several European and American countries, millions of people hunt or fish for recreation, spending billions of dollars on these sports.

**(iv) Scientific value :** Scientific studies of many of the wild life species are of direct value to humans. Thus, sea urchins have helped greatly in the understanding of human embryology. A desert toad has helped in early determination of pregnancy. Rhesus monkeys have contributed to the present knowledge of human blood groups. Antlers of deer help in determining the degree of radioactive contamination of natural environments. We do not know when some obscure wild animal species may be shot to prominence by providing a clue to human health and survival.

**(v) Aesthetic value :** There is a great world wide aesthetic value of wild life because of their sheer beauty and appeal to the human spirit. A world without melodious birds, graceful beasts and rapturous forests would be a poorer place for humans to live in. Without wild animals, a country side looks dead, static, monotonous and like a picture postcard. People feel pleasure, satisfaction and happiness in the presence of wild life.

**(vi) Ethical value :** Generally people think that they have no right to destroy wild animals; rather they feel an obligation for the conservation of nature and protection of wild life. In fact all religions preach a healthy respect and reverence for life and consider it wrong to take the life of an animal.

### (2) Sanctuaries and National Parks :

**(i) Definitions :** One of the best methods to save a wild life species, which is on the road to extinction, is to put it in a special enclosure to reproduce. This is best illustrated by sanctuaries and national parks whose legal definition varies from country to country. A *Sanctuary* or a *National Park* may be defined "as an area, declared by state, for the purpose of protecting, propagating or developing wild life therein, or its natural environment, for their scientific, educational and recreational value."

The difference between a sanctuary and a national park is subtle and even confusing. Hunting without permit is prohibited and grazing or movement of cattle regulated in a sanctuary. But hunting and grazing are absolutely prohibited in a national park which may be established within or outside a sanctuary.



(ii) **Famous national park of the world** : The first national park in the world, the *Yellowstone National Park*, was founded in 1872 in U.S.A. Since then, about 2,000 parks have been established all over the world. These offer protection to thousands of endangered species in their natural habitats. Some parks have been created for specific and very rare endangered species to be saved from extinction. Table provides a list of some of such famous parks of the world.

(iii) **Indian sanctuaries and national parks** : At present, 89 national parks and 202 sanctuaries are scattered throughout India. They comprise a total area of about 75,000 sq. km., which roughly comes to 19% of reserve forest area and 2.3% of total geographical area of the country. Sanctuaries and parks not only protect wild life but safeguard varied ecosystems, prevent soil erosion and help in recycling of wastes. Many of them are accessible to the Indian as well as foreign tourists and therefore of economic value. A glimpse of some important Indian national parks and sanctuaries is provided by the table.

**Table. 10.4-2 : Famous National Parks of World Created for Specific Endangered Species**

S. No.	Name of National Park	Country	Specific Endangered Animal
(1)	Alberta National Parks	Congo, Africa	Mountain Gorilla
(2)	Mt. Simien National Park	Ethiopia, Africa	Abyssinian Ibex or Steinbok
(3)	Bontebok National Park	South Africa, Africa	Bontebok antelope
(4)	Everglades National Park	Florida, U.S.A.	Puma
(5)	Rifugio di Los Padres	California, U.S.A.	Californian Condor
(6)	Ordesa National Park	Spain, Europe	Steinbok of pyrenees
(7)	Bialowieska National Park	Poland, Europe	European Bison
(8)	Corbett National Park	Uttar Pradesh, India	Kashmir Stag
(9)	Dachigam National Park	Kashmir, India	Kashmir Stag
(10)	Gir National Park	Gujarat, India	Asiatic Lion
(11)	Kaziranga National Park	Assam, India	One-homed Rhinoceros
(12)	Ghana bird sanctuary (Keoladeo National Park)	Bharatpur, Rajasthan, India	Avifauna

(3) **Wild Life Conservation** : A few voluntary organizations, like the Bombay Natural History Society (1883) have been involved in wildlife conservation in India since last century. Most of the British officers were fond of game hunting, but a few right-thinking officers who were concerned about the need for wildlife conservation wrote books about Indian wildlife and declared certain forests as protected areas. Mild legislative steps were also taken by the British Rule in 1873. However, an earnest effort for wildlife conservation through legislation was made only after independence. In 1952, the Central Government of India constituted the Indian Board for Wildlife (IBWL) for advising the Government for conserving our varied and fascinating natural bounty of wildlife. Subsequently, State Wildlife boards were also constituted in several Indian states.

A comprehensive Wildlife (Protection) Act, enacted by the Central Government in 1972, provided for legal protection of our wildlife, for nationalisation of already declared reserves, for setting up of National Parks and Sanctuaries for this purpose, and for severe punishment to poachers. Another important legislative step was the 42<sup>nd</sup> Amendment in Indian Constitution empowering the Central Government to ensure wildlife protection and to acquire forests for this purpose. Later, the Forest (Conservation) Bill of 1980 forbade deforestation of any forest for non-forestry purpose without the permission of the Central Government. In the meanwhile, India also became an important signatory to several International bodies like the International Union for Conservation of Nature and Natural Resources (IUCN), the World Wildlife Fund (WWF), Food and Agricultural Organisation (FAO), etc.

In accordance with the conservation strategies recommended by the World Convention of Conservationists mentioned earlier, wildlife conservation may be *ex situ* (i.e., in artificial habitats) or *in situ* (i.e., in natural habitats).

(i) **Ex-Situ conservation in India** : *Ex-situ* conservation requires establishment of rehabilitation centres for highly endangered species of wild animals. In accordance with the National Wildlife Action Plan (NWAP) of 1983, the activities of these centres include:

- (a) to capture some individuals of concerned species from their natural habitats and bring these to the centre,
- (b) to thoroughly study the feeding, breeding and other habits, and the diseases of these animals,
- (c) to provide all facilities to these animals for captive breeding and healthy growth of their brood, and
- (d) to release and rehabilitate the young ones of these animals after a certain safe age into their natural habitats.

Several rehabilitation centres have been established in various states all over the country during the past decade. For instance, the Uttar Pradesh Government has established a rehabilitation centre for Musk deer at Kanchula Kharak near Chamoli. Similarly, a big rehabilitation centre has been established in Kukrail forest near Lucknow with a comprehensive plan for rehabilitation of a number of wild animal types (swamp deer, chinkara, chausingha, black deer, foxes, wild dogs, jackal, wild fowls, falcon etc.). Rehabilitation of turtles and crocodiles has so far been achieved here.

(ii) **In-Situ conservation in India** : *In-situ* conservation requires protection of wild animals in their natural habitats. Obviously, it necessitates conservation of terrestrial and aquatic natural habitats of the wild animals. These habitats are, therefore, declared as prohibited reserves.

According to the degree of environmental protection afforded, we have four types of reserves in our country as follows :

(a) **National Parks (N.Ps)** : They are areas maintained by government and reserved for betterment of wildlife. Cultivation, grazing, forestry and habitat manipulation are not allowed. There are 89 national parks (66 in 1988) in India, occupying nearly 1.1% of geographical area. The first national park of India was Jim Corbett National Park (1936). Some early national parks of world are Yellowstone Park (USA) and Royal Park (near Sydney, Australia).

(b) **Sanctuaries** : A sanctuary is an area, which is reserved for the conservation of animals only. Operations such as harvesting of timber, collection of minor forest products and private ownership rights are allowed provided they do not affect the animals adversely. At present, there are 492 wild life sanctuaries in our country covering over one lac square kilometres, i.e., about 3% of Indian geographical area.

(c) **Tiger Reserves** : Fast decreasing census of the Royal Bengal Tiger prompted the Indian Government in 1972 to declare the tiger as National Animal, and to launch a special "Project Tiger" to save this magnificent member of our natural bounty from extinction. The project was spearheaded in collaboration with World Wildlife Fund (WWF) with substantial financial help from this international body. Some of the national parks and sanctuaries were declared as special "Tiger Reserves" under this project by central legislation. These reserves are controlled by state governments, but funded by both central and state governments. Each reserve has a highly protected and strictly prohibited central, core area of about 300 or more sq. km., and a sizable, peripheral, buffer zone with permission of limited, conservation-oriented human activities. Originally, 9 reserves were declared, but 10 more have since been added. Besides tigers, these reserves are also protecting other threatened species. The 19 reserves are as follows :

Table 10.4-3 The National Parks and Sanctuaries of India

S. No.	Names	Location	Special characteristics
(1)	Corbett national Park	Around Ramganga river, Ramnagar, Dhikola, Distt. Nainital. U.P.	First and Finest N.P.; Richest in biodiversity of threatened species.
(2)	Manas National Park	Around Manas river, Barpeta Road, Assam	Largest population of elephants. Hispid hare and pigmy hog are found only here.
(3)	Sunderbans National Park	Estuarine and highly saline marshy forest between Hoogly and Tetulia rivers in West Bengal.	Largest tiger population. World-famous man-eating tigers.
(4)	Palamu National Park	Around Koel river near Chhota Nagpur, Daltenganj, Bihar	Presence of tuskless male elephants is a speciality
(5)	Ranthambhor National Park	Around Aravali and Vindhyaachal ranges, Sawai Madhopur, Rajasthan	Smallest tiger reserve.
(6)	Melghat National Park	Near Tapti river, Ghaurilagarh hills, Maharashtra	-----
(7)	Kanha National Park	Around Sarpan river in Kanha valley, Mandla, Distt. Belaghat, Madhya Pradesh	Swamp deers or barahsingha are the jewels of this reserve.
(8)	Bandipur National Park	Between Negarhole, Wynad and Mudumalai parks along west coast, Karnataka	Known as best habitat for elephants.
(9)	Simlipal National Park	Around 12 rivers in Mayur Bhanj, Bihar	-----
(10)	Namdapha National Park	Around 3 hill rivers, Miao Distt. Tirap, Arunachal Pradesh	Known for rare leopards. Easternmost abods of many threatened species
(11)	Sariska National Park	Aravali range, Thana Gazi, Sariska, Alwar, Rajasthan	-----
(12)	Dudhwa National Park	Near Sohali-Neora river, Dudhwa, Lakhimpur Kheri, U.P.	Rhinoceros reintroduced and is surviving.
(13)	Buxa National Park	Near Sunkosi river and Manas tiger reserve, West Bengal	-----
(14)	Periyar National Park	Around Periyar river, Nillimpatti on Western Ghats, Kottayam, Kerala	Only abode of Nilgiri Tahr.
(15)	Indravati National Park	Around Indravati river, Bijapur, Distt. Bustar, Madhya Pradesh	Ideal for wild buffalo.
(16)	Nagarjunasagar Sanctuary	Near Nagarjunasagar reservoir of Krishna river, Mallamalai Hills, Andhra Pradesh	-----
(17)	Pench National Park	Pench, Distt. Seoni, Madhya Pradesh	-----
(18)	Valmiki Sanctuary	At Indo-Nepal border to west of Gandak river, Distt. Champaran, Bihar	-----
(19)	Kallakaddu Mundanthurai Sanctuary	Near Tambaravarni river, Distt. Tirunelveli, Tamil Nadu	-----



Table : 10.4-4 Some Wild Life Sanctuaries and National Parks of India

S. No.	Name and Location	Area in Sq. Km.	Important Animals found
(1)	<b>Nagarjuna Sagar (Ikshawaka Sanctuary)</b> Guntur, Prakasham, Kamool, Mahbubnagar & Nalgonda Distt. Andhra Pradesh	3568	Tiger, panther, slothbear, wild bear, nilgai, chital, sambar, black buck, jackal, fox, wolf, muggar crocodile
(2)	<b>Pulicat (Lake) Sanctuary</b> Nelore Distt, Andhra Pradesh	500	Flamingo, pelican, duck, teal, stork, crane, heron
(3)	<b>Kaziranga National Park</b> Sibsagar, Jorhat Distt, Assam	430	Rhinoceros, elephant, wild buffalo, gaur, sambar, swamp deer, hog deer, wild boar, tiger, leopard, gibbon, python, pelican, stork, florican
(4)	<b>Manas Sanctuary</b> Barpeta Distt, Assam	80	As in Kaziranga. Also wild dog, panther, golden langur, water monitor, great pied hornbill
(5)	<b>Hazaribagh Sanctuary</b> Hazaribagh, Bihar	186	Tiger, leopard, hyaena, wild boar, gaur, sambar, chital, nilgai, peafowl
(6)	<b>Palamau Sanctuary</b> Daltongunj, Bihar	980	Elephant, panther, leopard, wild boar, barking deer, gaur, chital, sambar, peafowl
(7)	<b>Kaimur Sanctuary</b> Rohtas, Bihar	1342	Tiger, leopard, chinkara, sambar, nilgai, crocodiles
(8)	<b>Gir National park</b> Sasan-Gir, Junagarh Distt, Gujrat	1412	Asiatic lion, panther, striped hyaena, sambar nilgai, chital, 4-horned antelope, chinkara
(9)	<b>Sultanpur (Lake) Bird Sanctuary</b> Gurgaon, Haryana	1.2	Wild boar, crocodiles, python, green pigeon Sarus crane, spot bill, ducks, ruddy shell
(10)	<b>Dachigam Sanctuary</b> Srinagar, Jammu & Kashmir	89	Snow leopard, black & brown bears, hangul, musk deer, serow.
(11)	<b>Shikari Devi Sanctuary</b> Mandi, Himachal Pradesh	213	Black bear, panther, snow leopard, goral, barking & musk deers, serow, flying fox, monal, chir, chukor, partridge
(12)	<b>Govind Sagar Bird Sanctuary</b> Bilaspur, Himachal Pradesh	100	Teal, ducks, goose, crane
(13)	<b>Bandipur National Park</b> Mysore Distt. Karnataka	874	Elephant, tiger, panther, wild boar, wild dog, sloth bear, gaur, barking deer, 4-horned antelope, sambar, chital, malabar squirrel, green pigeon
(14)	<b>Periyar Sanctuary</b> Idukki Distt. Kerala	777	Elephant, tiger, panther, wild boar, wild dog, sloth bear, gaur, nilgai, sambar, barking deer, black nilgiri langur, grey hornbill, egret
(15)	<b>Kanha National Park</b> Mandla & Balaghat, Madhya Pradesh	940	Tiger, panther, wild boar, wild dog, gaur, barasingha, sambar, chital, black buck, nilgai, barking & mouse deers
(16)	<b>Tadoba National Park</b> Chandrapur, Maharashtra	116	Tiger, panther, sloth bear, gaur, sambar, chital, nilgai, chinkara, crocodiles
(17)	<b>Pench National Park</b> Nagpur, Maharashtra	257	Tiger, panther, sloth bear, gaur, sambar, chital, nilgai, chinkara, barking deer, peafowl
(18)	<b>Bhitarkanika Sanctuary</b> Cuttack, Orissa	170	Salt water crocodile, leopard, hyaena, chital, sambar, giant squirrel, water monitor king cobra, python, storks, ibis.
(19)	<b>Chilka Lake Bird Sanctuary</b> Balagaon, Orissa	900	Flamingo, pelican, egret, ibis, cormorant crane, duck, sandpiper, curlew
(20)	<b>Simlipal Sanctuary</b> Baripad, Mayurbhanj, Orissa	303	Tiger, leopard, elephant, wild boar, gaur, sambar, mouse deer, flying squirrel, mugger
(21)	<b>Sariska (Project Tiger)</b> Alwar, Rajasthan	195	Tiger, Panther, wild boar, hyaena, sambar, chinkara, nilgai, 4-horned antelope, langur
(22)	<b>Keoladeo Ghana Bird Sanctuary</b> Bharatpur, Rajasthan	29	Siberian crane, storks, herons, cormorant, spoon bill, egret, ibis, etc., sambar, chital, boar, python
(23)	<b>Desert National Park</b> Jaisalmer, Barmer, Rajasthan	3000	Great Indian bustard, black buck, chinkara

(24)	<b>Annamalai Sanctuary</b> Coimbatore, Tamilnadu	958	Elephant, tiger, panther, sloth bear, wild dog, gaur, chital, sambar
(25)	<b>Corbett National Park</b> Nainital Distt. Uttaranchal	525	Elephant, tiger, panther, sloth bear, wild boar, nilgai, sambar, chital, crocodiles, python, king cobra, peafowl, partridge
(26)	<b>Jaldapara Sanctuary</b> Madarihat, West bengal	115.5	Rhino, elephant, tiger, leopard, gaur, deers, sambar, variety of birds
(27)	<b>Sajnakhali Sanctuary</b> 24-Parganas, West Bengal	362	Tiger, Wild boar, chital, storks, cormorant, herons, ibis, pelican, bittern, darter
(28)	<b>Sundarbans (Tiger Reserve)</b> 24-Parganas, West Bengal	2585	Tiger, Wild boar, deers estuarine crocodile, gangetic dolphin.

Table : 10.4-5 Biosphere Reserves of India

(1)	Nilgiri Biosphere Reserve (Kerala, Karnataka and Tamil Nadu)- First to be established in 1986.
(2)	Nanda Devi Biosphere Reserve (Uttaranchal)
(3)	Nokrek Biosphere Reserve (Tura Range, Meghalaya)
(4)	Great Nicobar Biosphere Reserve (Andaman and Nicobar)
(5)	Gulf of Mannar Biosphere Reserve (Tamil Nadu)
(6)	Manas Biosphere Reserve (Assam)
(7)	Dibru Saikhowa Biosphere Reserve (Assam)
(8)	Dehang Debang Biosphere Reserve (Arunachal)
(9)	Sundarbans Biosphere Reserve (West Bengal)
(10)	Similipal Biosphere Reserve (Orissa)
(11)	Khangchendzonga Biosphere Reserve (Sikkim)
(12)	Pachmarhi Biosphere Reserve (Madhya Pradesh)
(13)	Agasthyamalai Biosphere Reserve (Kerala)
(14)	Thar Desert Biosphere Reserve (Rajasthan)- To be established
(15)	Little Rann of Kutch Biosphere Reserve (Gujrat)- To be established

(4) **Threatened Species** : Species of wild animals whose normal survival upon the earth is jeopardised due to their destruction or destruction of their habitats by human beings are called threatened species.

Threatened species in India are about 81 species of wild mammals, about 30 wild birds, about 15 bird reptiles and amphibians and many invertebrates are presently on the verge of extinction. Some important animals are following.

(i) **Wild mammals** on the verge of extinction include the lion, tiger, wolves, jackals, foxes, bears, civets, loris, most species of monkeys, scaly anteater (manis), snow leopard, rhinoceros, wild ass, wild pigs, musk deer. Kashmir stag and several other species of deers, black buck and other species of antelopes, flying squirrels, dolphins, porcupine, gaur, wild sheep and goats, Gibbon, elephant, wild buffalo, etc.

(ii) **Wild birds** of our fauna at the verge of extinction mainly include white-winged ducks, swans, falcon, sea eagle, bamboo partridge, mountain quail, Indian skimmer, painted spur fowls, hornbill, bustard, pheasant, Sarus crane, etc.

(iii) **Wild reptiles** on the verge of extinction include several species of turtles, tortoises, crocodiles, gharial, monitor lizard, and poisonous snakes and python.

(iv) **Wild amphibians** on the verge of extinction include viviparous toad and Himalayan newt.

Table : 10.4-6 List of Some Protected Indian Wild Life

Mammals	
(1)	Bharal ( <i>Ovis nahura</i> )
(2)	Bison or gaur or mithun ( <i>Bos gaurus</i> )
(3)	Black buck ( <i>Antelope cervicapra</i> )
(4)	Capped langur ( <i>Presbytis pileatus</i> )
(5)	Caracal ( <i>Felis caracal</i> )
(6)	Chinkara or Indian Gazelle ( <i>Gazella gazella bennetti</i> )
(7)	Chital ( <i>Axis axis</i> )
(8)	Clouded leopard ( <i>Neofelis nebulosa</i> )
(9)	Crab-eating macaque ( <i>Macaca irus umbrosa</i> )
(10)	Fishing cat ( <i>Felis viverrina</i> )
(11)	Flying squirrels ( <i>Petaurista</i> , <i>Eupetaurus</i> , <i>Belomys</i> , <i>Hylopetes</i> . All species)
(12)	Four-horned antelope ( <i>Tetracerus quadricornis</i> )
(13)	Gangetic dolphin ( <i>Platanista gangetica</i> )
(14)	Gaint squirrels ( <i>Ratufa macroura</i> , <i>R. indica</i> , <i>R. bicolor</i> )
(15)	Golden cat ( <i>Felis temmincki</i> )
(16)	Golden langur ( <i>Presbytis geei</i> )
(17)	Gorals ( <i>Nemorhaedus goral</i> , <i>N. hodgsoni</i> )
(18)	Himalayan black bear ( <i>Selenarctos thibetanus</i> )
(19)	Himalayan brown bear ( <i>Ursus arctos</i> )
(20)	Himalayan ibex ( <i>Capra ibex</i> )
(21)	Himalayan crestless porcupine ( <i>Hystrix hodgsoni</i> )
(23)	Hispid hare ( <i>Caprolagus hispidus</i> )
(24)	Hoolock or gibbon ( <i>Hylobates hoolock</i> )
(25)	Hyaena ( <i>Hyaena hyaena</i> )
(26)	Indian elephant ( <i>Elephas maximus</i> )
(27)	Indian lion ( <i>Panthera leo persica</i> )
(28)	Indian pangolin ( <i>Manis crassicaudata</i> )
(29)	Indian wild ass ( <i>Equus hemionus khur</i> )
(30)	Indian wolf ( <i>Canis lupus</i> )
(31)	Kashmir stag or hangul ( <i>Cervus elaphus hanglu</i> )
(32)	Leopard or panther ( <i>Panthera pardus</i> )
(33)	Leopard cat ( <i>Felis bengalensis</i> )
(34)	Lesser or red panda ( <i>Ailurus fulgens</i> )
(35)	Lion-tailed macaque ( <i>Macaca silenus</i> )
(36)	Loris ( <i>Loris tardigradus</i> )



(37)	Malabar civet ( <i>Viverra zibetha</i> )
(38)	Markhor ( <i>Capra falconeri</i> )
(39)	Musk deer ( <i>Moschus moschiferus</i> )
(40)	Nilgai ( <i>Boselaphus tragocamelus</i> )
(41)	Nilgiri langur ( <i>Presbytis johni</i> )
(42)	Nilgiri tahr ( <i>Hemitragus hylocrius</i> )
(43)	Otters ( <i>Lutra lutra</i> , <i>L. perspicillata</i> , <i>Aonyx cinerea</i> )
(44)	Pallas's cat ( <i>Felis manul</i> )
(45)	Pig-tailed macaque ( <i>Macaca nemestrina</i> )
(46)	Pigmy hog ( <i>Sus suluensis</i> )
(47)	Red fox ( <i>Vulpes vulpes</i> )
(48)	Rhinoceros ( <i>Rhinoceros unicornis</i> )
(49)	Sambar ( <i>Cervus unicolor</i> )
(50)	Sloth bear ( <i>Melursus ursinus</i> )
(51)	Slow loris ( <i>Nycticebus coucang</i> )
(52)	Snow leopard ( <i>Panthera uncia</i> )
(53)	Swamp deer or gond ( <i>Cervus duvauceli</i> , all species)
(54)	Tibetan antelope or chiru ( <i>Pantholope hodgsoni</i> )
(55)	Tibetan fox ( <i>Vulpes ferrilatus</i> )
(56)	Tibetan gazelle ( <i>Procapra picticaudata</i> )
(57)	Tibetan wild ass ( <i>Equus hemionus kiang</i> )
(58)	Tiger ( <i>Panthera tigris</i> )
(59)	Wild buffalo ( <i>Bubalus bubalis</i> )
(60)	Wild dog or dhole ( <i>Cuon alpinus</i> )
(61)	Wild pig ( <i>Sus scrofa</i> )
(62)	Wild yak ( <i>Bos grunniens</i> )

**Reptiles**

(1)	Estuarine crocodile ( <i>Crocodylus porosus</i> )
(2)	Gharial ( <i>Gavialis gangeticus</i> )
(3)	Leathery turtle ( <i>Dermochelys coriacea</i> )
(4)	Marsh crocodile ( <i>Crocodylus palustris</i> )
(5)	Monitor lizards ( <i>Varanus griseus</i> , <i>V. bengalensis</i> , <i>V. flavescens</i> , <i>V. salvator</i> , <i>V. nebulosus</i> )
(6)	Pythons ( <i>Python molurus</i> , <i>P. reticulatus</i> )

**Birds**

(1)	Cheer pheasant ( <i>Catreus wallichii</i> )
(2)	Great Indian bustard ( <i>Choriostes nigriceps</i> )
(3)	Great Indian hornbill ( <i>Buceros bicornis</i> )
(4)	Jerdons's courser ( <i>Cursorius bitorquatus</i> )
(5)	Large falcons ( <i>Falco peregrinus</i> , <i>F. biarmicus</i> , <i>F. chicquera</i> )
(6)	Mountain Quail ( <i>Oppassia superciliosa</i> )
(7)	Peafowl ( <i>Pavo cristatus</i> )
(8)	Pink-headed duck ( <i>Rhodonessa caryophyllacea</i> )
(9)	Sclater's monal ( <i>Lophophorus sclateri</i> )
(10)	Siberian white crane ( <i>Grus leucogeranus</i> )
(11)	Tragopan pheasants ( <i>Tragopan species</i> )

**Table : 10.4-7 Some Endangered Plant Species of India**

(1)	<i>Abies delavayi</i> (Gymnosperm).
(2)	<i>Taxus baccata</i> (Gymnosperm).
(3)	<i>Picea brachytyla</i> (Gymnosperm).
(4)	<i>Psilotum nudum</i> (Gymnosperm).
(5)	<i>Angiopteris erecta</i> (Pteridophyte).
(6)	<i>Adiantum griffithii</i> .
(7)	<i>Vanilla plicifera</i> .
(8)	<i>Rauwolfia serpentina</i> .
(9)	<i>Nepenthes khasiana</i> .
(10)	<i>Atropa acuminata</i> .
(11)	<i>Saussurea bracteata</i> .
(12)	<i>Coptis teeta</i> .
(13)	<i>Strychnos nux-vornica</i> .

## T Tips & Tricks

- ✍ Biological diversity day : 29<sup>th</sup> December
- ✍ Biodiversity Act of India was passed by the parliament in the year 2002.
- ✍ Red Data Book : It is the compilation of data on species threatened with extinction.
- ✍ Green Data Book : A book containing a list of rare plants growing in protected areas like Botanical Gardens.
- ✍ Dodo bird (*Didus ineptus*) of Mauritius extensively killed due to its beautiful features.
- ✍ According to December 26<sup>th</sup> 1995 report, the "Red Panda Project" has been started to protect Red Panda (*Ailurus fulgens*) endangered species from extinction in Himalayan region.
- ✍ Rajaji National Park is situated in Utranchal.
- ✍ Endemic species : A species found in a particular natural habitat only e.g., *Ficus religiosa*, *Butea monosperma*.
- ✍ Cheetah has recently become extinct from India. Only wild population of cheetah is found in Africa.
- ✍ Gharial (*Gavialis gangeticus*) is found only in India.
- ✍ William Hornaday : Coined the term wildlife, wrote the book "Our Vanishing Wild life".
- ✍ World Environment Day – 5<sup>th</sup> June.
- ✍ World Conservation Day : 3rd December.
- ✍ The Environment protection Act was passed in 1986.
- ✍ World Animal Day : 3rd October.
- ✍ Wild life Institute of India : Located at Dehradun, Utranchal.
- ✍ SATYA : Save Tiger Youth Association.
- ✍ Kew London is famous for herbarium.
- ✍ Periyar wild life sanctuary is located at : Idduki (Kerala)
- ✍ World wild life week is first week of October.

# Ordinary Thinking

## Objective Questions

### Biodiversity and Conservation

- Which of the following is not an ex-situ conservation [KCET 2015]
  - Cryopreservation
  - Seed bank
  - Biosphere reserves
  - Botanical garden
- Find the wrongly matched pair [KCET 2015]
 

(a)	Lungs of the planet	–	Amazon rain forest
(b)	Endemism	–	Species confined to one region and also found in other regions
(c)	Hot spots	–	Regions with species richness
(d)	Alien species	–	Clarias gariepinus
- Each couple should produce only two children which will help in [MP PMT 1994; AMU (Med.) 1998]
  - Checking pollution
  - Stabilizing the ecosystem
  - Fertility of soil
  - Improving food web
- In which state of India is Chandraprabha sanctuary situated [MP PMT 2013]
  - Madhya Pradesh
  - Uttar Pradesh
  - Karnataka
  - Arunachal Pradesh
- Red data book provides data on [CBSE PMT 1999; Kerala CET 2002; BHU 2008]
  - Red flowered plants
  - Red coloured fishes
  - Endangered plants and animals
  - Red eyed birds
- World Wild Life Week is [CBSE PMT 1999; Kerala CET 2002]
  - First week of September
  - First week of October
  - Third week of October
  - Last week of October
- Black buck in India is protected by [Pb. PMT 1999]
  - Bhils
  - Bishnois
  - Phasis
  - All tribals
- Tiger is not a resident in which one of the following national park [CBSE PMT 2009]
  - Ranthamhbor
  - Sunderbans
  - Gir
  - Jim Corbett
- Which is preserved in National Park [BHU 2000]
  - Flora
  - Fauna
  - Both (a) and (b)
  - None of these
- One of the following plant species is in endangered list [Haryana PMT 2000]
  - Eucalyptus*
  - Nepenthes*
  - Ceratophyllum*
  - Delonix*
- Which one of the following has maximum genetic diversity in India [CBSE PMT 2009]
  - Teak
  - Mango
  - Wheat
  - Tea
- Red data book is maintained by [BVP Pune 2001; AIEEE Pharmacy 2004; NEET (Karnataka) 2013]
 

Or

List of endangered species was released by

Or

The organization which publishes the Red List of species is [AFMC 2009; CBSE PMT 2014; MH CET 2015]

  - IUCNNR
  - The Bombay Natural History Society
  - WPSI
  - IUCN
- In India, we find mangoes with different flavours, colours, fibre content, sugar content and even shelf life. The large variation is on account of [AIIMS 2008, 13]
  - Species diversity
  - Induced mutations
  - Genetic diversity
  - Hybridization
- Which of the following species are restricted to a given area [CPMT 1999; JIPMER 2001; BHU 2004; WB JEE 2011; J & K CET 2012]
 

Or

The species confined to a particular region and not found elsewhere is termed as [AIPMT 2015]

  - Sympatric species
  - Allopatric species
  - Sibling species
  - Endemic species
- New approach to conservation is the establishment of [KCET 1999]
 

Or

What is most effective way to conserve plant diversity of an area [CBSE PMT 2004]

  - Sanctuaries
  - Reserve forests
  - National parks
  - Biosphere reserves
- The presence of diversity at the junction of territories of two different habitats is known as [BHU 2005]
  - Bottle neck effect
  - Edge effect
  - Junction effect
  - Pasteur effect
- Biodiversity Act of India was passed by the parliament in the year [NCERT; CBSE PMT 2005]
  - 1992
  - 1996
  - 2000
  - 2002
- Which of the following plants are commonly found in Sunderban Biosphere Reserve [Odisha JEE 2012]
  - Mangroves
  - Cactus
  - Juniperus
  - Conifers
- Cryopreservation of gametes of threatened species in viable and fertile condition can be referred to as [AIPMT (Cancelled) 2015]
  - Advanced ex-situ conservation of biodiversity
  - In situ conservation by sacred groves
  - In situ cryo-conservation of biodiversity
  - In situ conservation of biodiversity
- One of the ex-situ conservation methods for endangered species is [AIIMS 2005, 08]
  - Wildlife Sanctuaries
  - Biosphere Reserves
  - Cryopreservation
  - National parks
- Genetic diversity in agricultural crops is threatened by [AIIMS 2005]
  - Introduction of high yielding varieties
  - Intensive use of fertilizers
  - Extensive intercropping
  - Intensive use of biopesticides



22. Wildlife is [Odisha JEE 2005]  
(a) All biota excluding man, domestic animals and cultivated crops  
(b) All vertebrates of reserve forests  
(c) All animals of reserve forests  
(d) All animals and plant of reserve forest
23. One of the most important functions of botanical gardens is that [CBSE PMT 2005]  
(a) They provide a beautiful area for recreation  
(b) One can observe tropical plants there  
(c) They allow *ex-situ* conservation of germplasm  
(d) They provide the natural habitat for wild life
24. Choose the wrongly matched pair [Kerala PMT 2012]  
(a) World Summit on – Johannesburg Sustainable Development, 2002  
(b) Carrot grass – Lantana  
(c) Wildlife safari parks – Ex-situ conservation  
(d) Amazon rain forest – Lungs of the planet  
(e) Khasi and jaintia hills – Meghalaya
25. Ecological hot spots present in India are  
(a) One (b) Two  
(c) Three (d) Four
26. Community is [RPMT 2005, 06]  
(a) A group of independent and interacting population of different species  
(b) A group of independent and interacting population of same species  
(c) A group of independent and interacting population of same species in a specific area  
(d) A group of independent and interacting population of different species in a specific area
27. Convention of Biodiversity came into force on [KCET 2006]  
(a) 29 December 1993 (b) 6 June 1992  
(c) 3 October 1994 (d) 4 October 1993
28. Which one of the following is not observed in biodiversity hotspots [CBSE PMT 2008]  
(a) Lesser inter-specific competition  
(b) Species richness  
(c) Endemism  
(d) Accelerated species loss
29. Which of the following is the most important cause of animals and plants being driven to extinction [NEET (Phase-I) 2016]  
(a) Over - exploitation  
(b) Alien species invasion  
(c) Habitat loss and fragmentation  
(d) Co - extinctions
30. The largest tiger reserve in India is [NEET (Karnataka) 2013]  
(a) Valmiki (b) Nagarjunsagar – Srisailem  
(c) Periyar (d) Nagarhole
31. The term hot spot for high diversity ecological regions was coined by  
(a) IUCN (b) Myers  
(c) Odum (d) Kormandy
32. Which of the following regions of our country are known for their rich biodiversity [AIIMS 2005, 08; MP PMT 2005; KCET 2006]  
Or  
Which of the following are considered hot-spot of biodiversity in India [NCERT; CBSE PMT 2006; CBSE PMT (Pre.) 2012]  
Or  
In India, rain forests are found in  
(a) Western ghats and eastern himalayas  
(b) Western ghats and deccan plateau  
(c) Eastern himalayas and gangetic plane  
(d) Trans himalayas and deccan peninsula
33. The state of Gujarat has river, desert, forest and lake ecosystems, thus exhibiting a diversity of life. Which measure do you use to denote total diversity in such a case [EAMCET 2009]  
Or  
The diversity of the habitats over the total geographical area is called [Kerala PMT 2007]  
(a)  $\alpha$  (alpha) (b)  $\beta$  (beta)  
(c)  $\gamma$  (gamma) (d)  $\delta$  (delta)
34. A taxon which is facing an extremely high risk of extinction in the wild in immediate future is known as [Kerala PMT 2009; CBSE PMT 2014]  
(a) Rare (b) Exotic  
(c) Vulnerable (d) Endangered  
(e) Critically endangered
35. *Antelope cervicapra*/Black Buck is  
(a) Vulnerable (b) Endangered  
(c) Critically endangered (d) Extinct in the wild
36. India become a party to 'Convention on Biological Diversity' in the year [WB JEE 2008]  
(a) 1994 (b) 1993  
(c) 1992 (d) 1988
37. Hoolock Gibbon (India's only ape), is found in [DPMT 2006]  
(a) Kaziranga Bird Sanctuary (b) Hazaribagh National Park  
(c) Corbett National Park (d) Gir National Park
38. The first biosphere reserve established in India for conserving the gene pool of flora and fauna and the life style of tribals is [Kerala CET 2003]  
(a) Nilgiri biosphere reserve  
(b) Nanda Devi biosphere reserve  
(c) Uttarakhand biosphere reserve  
(d) Great Nicobar biosphere reserve
39. One of these is not concerned with wild life conservation [MP PMT 2009]  
(a) IVF (b) IUCN  
(c) WWF (d) IBWL
40. Which of the following pairs of an animal and a plant represent endangered organism in India [CBSE PMT 2006]  
(a) *Cinchona* and Leopard  
(b) Banyan and Black buck  
(c) *Bentinckia nicobarica* and Red Panda  
(d) Tamarind and Rhesus monkey

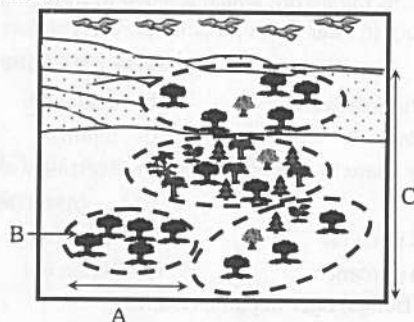
41. Breeding ground for migratory flamingo is \_\_\_\_\_  
[GUJCET 2014]

- (a) Area between khadir and Paccham island in great Rann of Kachch  
(b) Area of Gulf of Kachch (Kutch)  
(c) Area of great Rann of Kachch (Kutch) and little Rann of Kachch (Kutch)  
(d) Area of Nal Sarovar Bird Sanctuary

42. Largest tiger population is found in \_\_\_\_\_ [MP PMT 2009]

- (a) Sunderban national park  
(b) Corbett national park  
(c) Ranthambhor national park  
(d) Kanha national park

43. The following diagram shows different types of diversity. Identify them [NCERT]



- (a) A - Beta - diversity, B - Alpha - diversity, C - Gamma - diversity  
(b) A - Gamma - diversity, B - Beta - diversity, C - Alpha - diversity  
(c) A - Gamma - diversity, B - Alpha - diversity, C - Beta diversity  
(d) A - Alpha - diversity, B - Beta - diversity, C - Gamma diversity

44. Term 'biosphere' is used for the zone of earth where life exists

- (a) On lithosphere  
(b) In the hydrosphere  
(c) In the lithosphere and hydrosphere  
(d) In the lithosphere, hydrosphere and atmosphere

45. Which one of the following pairs of organisms are exotic species introduced in India [CBSE PMT 2007]

- (a) *Ficus religiosa*, *Lantana camara*  
(b) *Lantana camara*, water hyacinth  
(c) Water hyacinth, *Prosopis cineraria*  
(d) Nile perch, *Ficus religiosa*

46. One of endangered species of Indian medicinal plants is that of \_\_\_\_\_ [CBSE PMT 2007]

- (a) *Podophyllum* (b) *Ocimum*  
(c) Garlic (d) *Nepenthes*

47. Red list of plant species of India is formed by [DPMT 2007]

- (a) Botanical Survey of India  
(b) Zoological Survey of India  
(c) Geological Survey of India  
(d) None of these

48. Dodo, an extinct flightless bird, belonged to

- (a) Mauritius (b) Lakshadweep  
(c) Cannada (d) Iceland

49. First biosphere reserve was established in 1986 at

- (a) Nilgiri (b) Nanda Devi  
(c) Little Rann of Kutch (d) Sunderbans

50. Which one of the following is not included under *insitu* conservation

[CBSE PMT 2006; KCET 2009; WB JEE 2012; BHU 2012]

- (a) Biosphere reserve  
(b) National park  
(c) Sanctuary  
(d) Botanical/Zoological garden

51. Silent Valley having rare plants and animals is located is

- (a) Kerala (b) Karnataka  
(c) Jammu and Kashmir (d) Andhra Pradesh

52. Which one is connected with conservation of forests

- (a) Gir (b) Silent Valley  
(c) Kaziranga (d) Bharatpur

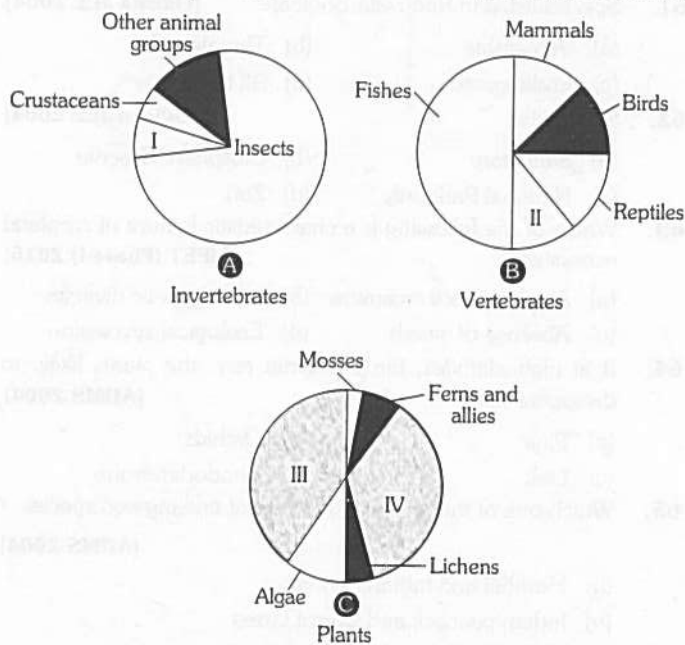
53. Recently attempts are being made to reintroduce tigers in this famous National Park [AMU (Med.) 2010]

- (a) Corbett (b) Bandavgarh  
(c) Sariska (d) Kanha

54. Decrease in species diversity in tropical countries is mainly due to [AIIMS 1996; BHU 2012]

- (a) Urbanisation (b) Pollution  
(c) Deforestation (d) Soil erosion

55. The following are pie diagrams A, B and C related to proportionate number of species of major taxa of invertebrates, vertebrates and plants respectively. Study and select the right option in which all the blanks I, II, III and IV are correctly identified [NCERT; KCET 2015]



- (a) I - Turtles, II - Amphibians, III - Fungi, IV - Angiosperms  
(b) I - Hexapoda, II - Amphibians, III - Fungi, IV - Angiosperms  
(c) I - Molluscs, II - Amphibians, III - Angiosperms, IV - Fungi  
(d) I - Molluscs, II - Amphibians, III - Fungi, IV - Angiosperms



56. Biosphere reserves are being threatened with  
[CBSE PMT 2000]  
(a) Population growth (b) Rains  
(c) Pollution (d) All the above
57. *Idri idri* occurs in  
[CBSE PMT 2000]  
(a) India (b) Mauritius  
(c) Fiji (d) Madagascar
58. Which one is endangered member of flora [BHU 2003]  
(a) *Drosera Indica* (b) One horned Rhino  
(c) Flying Squirrel (d) None of the above
59. Select the correct statement about biodiversity  
[CBSE PMT (Mains) 2012]  
(a) The desert areas of Rajasthan and Gujarat have a very high level of desert animal species as well as numerous rare animals  
(b) Large scale planting of Bt cotton has no adverse effect on biodiversity  
(c) Western Ghats have a very high degree of species richness and endemism  
(d) Conservation of biodiversity is just a fad pursued by the developed countries
60. Species very near to extinction if conservation measures are not promptly taken is [BHU 2003]  
(a) Threatened species (b) Rare species  
(c) Endangered species (d) Vulnerable species
61. Species listed in Red Data Book are [Odisha JEE 2004]  
(a) Vulnerable (b) Threatened  
(c) Endangered (d) All the above
62. Similipal is [Odisha JEE 2004]  
(a) Sanctuary (b) Biosphere Reserve  
(c) National Park only (d) Zoo
63. Which of the following is a characteristic feature of cropland ecosystem [NEET (Phase-I) 2016]  
(a) Absence of soil organisms (b) Least genetic diversity  
(c) Absence of weeds (d) Ecological succession
64. If at high altitudes, birds become rare, the plants likely to disappear are [AIIMS 2004]  
(a) Pine (b) Orchids  
(c) Oak (d) Rhododendrons
65. Which one of the following is a pair of endangered species  
s [AIIMS 2004]  
(a) Hornbill and Indian Aconite  
(b) Indian peacock and Carrot Grass  
(c) Garden lizard and Mexican poppy  
(d) Rhesus monkey and Sal tree
66. Wild life conservation means the protection and preservation of [BHU 2004]  
(a) Ferocious wild animals only  
(b) Wild plants only  
(c) Non-cultivated plants and non-domesticated animals  
(d) All the above living in natural habitat
67. Consider the following statements  
A. By the end of twentieth century, the forest cover in India was reduced to 19.4 percent  
B. National Forest Policy was implemented in the year 1988  
C. The average annual production of dry grass or hay in India is about 250 million tons  
D. About 10% of the world's population lives in arid or semi arid regions  
Of these statements [Kerala PMT 2007]  
(a) A and B are true (b) A, C and D are not true  
(c) A, B and C are true (d) C is not true  
(e) C and D are true
68. .... is the taxon, which is likely to move into endangered category in near future, if conditions prevail as it is  
[Kerala PMT 2003; KCET 2007]  
(a) Vulnerable (b) Endanger  
(c) Rare (d) Extinct
69. India's share in the global species diversity is about [AMU (Med.) 2010, 12]  
(a) 2 percent (b) 4 percent  
(c) 6 percent (d) 8 percent
70. If the Bengal tiger becomes extinct [AIIMS 2004]  
(a) Hyenas and wolves will become scarce  
(b) The wild area will be safe for man and domestic animals  
(c) Its gene pool will be lost for ever  
(d) The population of beautiful animals like deers will get stablized
71. According to IUCN Red List, what is the status of Red Panda (*Ailurus fulgens*) [CBSE PMT 2005]  
(a) Vulnerable species  
(b) Critically endangered species  
(c) Extinct species  
(d) Endangered species
72. Asiatic lion (*Panthera leo persica*) is now [Odisha JEE 2005]  
(a) Endangered (b) Extinct in wild  
(c) Vulnerable (d) Critically endangered
73. Biosphere reserve programme started in India [RPMT 1996; Odisha JEE 2005]  
(a) 1986 (b) 1984  
(c) 1982 (d) 1988
74. Which group of vertebrates comprises the highest number of endangered species [CBSE PMT 2003]  
(a) Birds (b) Mammals  
(c) Fishes (d) Reptiles
75. National bird of India is [KCET 1994; RPMT 2000]  
(a) Hornbill (b) Black swan  
(c) Peacock (*Pava cristatus*) (d) House sparrow
76. The species diversity of plants on earth will be [Kerala PMT 2010]  
(a) 2.4% (b) 22%  
(c) 8.1% (d) 85%  
(e) 70%

77. The lion tailed monkeys '*Malaca Malaca Silenus*' are found only in these regions [MP PMT 1993]  
(a) Khaziranga and other parts of Assam  
(b) Eastern ghats and Madras  
(c) Western ghats including Travancore-Mysore  
(d) Himalayan mountains
78. What is the generic name of Indian peacock [DPMT 1993; Odisha JEE 2008]  
(a) *Pavo cristatus* (b) *Milvus migrans*  
(c) *Paradise flycatcher* (d) *Parser domesticus*
79. The largest Indian poisonous snake is [DPMT 1993]  
(a) Python (b) Krait  
(c) Cobra (d) Sea snake
80. Which of the following animal has become almost extinct in India [AIIMS 1993; CPMT 1994; Odisha JEE 2010]  
(a) Wolf (b) Rhinoceros  
(c) Hippopotamus (d) Cheetah
81. Which of the following types of animals does man chiefly protect [JIPMER 1993]  
(a) Harmless animals (b) Economically useful  
(c) Those likely to perish (d) Feeble animals
82. Sacred groves are specially useful in [CBSE PMT (Mains) 2012]  
(a) Generating environmental awareness  
(b) Preventing soil erosion  
(c) Year-round flow of water in rivers  
(d) Conserving rare and threatened species
83. Hippopotamus is found in  
(a) America (b) Africa  
(c) Asia (d) Australia
84. Which of the following is mainly responsible for the extinction of wild life [CBSE PMT 1999]  
(a) Hunting for flesh (b) Destruction of habitats  
(c) Pollution of air and water (d) All of these
85. Manas sanctuary is located at [KCET 2007]  
(a) Rajasthan (b) Assam  
(c) Bihar (d) Gujarat
86. In India, commonly available Rhesus monkey is  
(a) *Macaca mulatta* (b) *Alouatta*  
(c) *Ateles paniscus* (d) *Ateles geoffroyi*
87. Hotspots of biodiversity means [DUMET 2010]  
(a) Areas of the earth that contain many endemic species  
(b) Species severes as proxy for entire communities in particular area  
(c) Species in particular niche/area  
(d) Species diversity at particular area
88. Now-a-days rhino is present in  
(a) Asia (b) Africa  
(c) America (d) Africa and Asia
89. Identify the correct pair of an animal and its habitat region [AIEEE Pharmacy 2004]  
(a) Elephant – Ranthambore  
(b) Flamingo – Rann of Kutch  
(c) Wild ass – Dachigam  
(d) Great Indian Bustard – Assam
90. How many hot spots of biodiversity in the world have been identified till date by Norman Myers [NCERT; AMU (Med.) 2012; NEET (Phase-II) 2016]  
(a) 25 (b) 24  
(c) 40 (d) 34
91. The Wildlife (protection) Act 1972 was first amended in [DUMET 2010]  
(a) 1991 (b) 1995  
(c) 2001 (d) 2007
92. Which of the following is true for national parks [Odisha JEE 2004]  
(a) Tourism is allowed in buffer zone  
(b) No human activity is allowed  
(c) Hunting allowed in core zone  
(d) Cattle grazing is allowed in buffer zone
93. In a biosphere reserve, limited human activity is permitted in [AFMC 2002]  
(a) Core zone (b) Buffer zone  
(c) Manipulation zone (d) None of these
94. Which monkey has prehensile tail [MP PMT 1995]  
(a) Spider monkey (b) Semnopithecus  
(c) Rhesus monkey (d) Bonnet monkey
95. Bandipur in Karnataka state is the site of [KCET 1994]  
(a) The tiger project (b) The deer project  
(c) The peacock project (d) The elephant project
96. The most important human activity leading to the extinction of wildlife is [CBSE PMT 1994]  
(a) Alteration and destruction of the natural habitats  
(b) Hunting for commercially valuable wild life products  
(c) Pollution of air and water  
(d) Introduction of alien species
97. Which of the following is not done in a wild life sanctuary [BHU 2005]  
(a) Fauna is conserved (b) Flora is conserved  
(c) Soil and flora is utilised (d) Hunting is prohibited
98. Species living in a restricted geographical area is [DPMT 2006]  
(a) Sympatric (b) Allopatric  
(c) Sibling (d) Keystone
99. Giraffe is common animal of [RPMT 2000]  
(a) Desert (b) Savanna  
(c) Rain forest (d) Praire
100. Which step is required for better survival of human beings [MP PMT 2001]  
(a) Conservation of wild life  
(b) Afforestation  
(c) Ban on mining  
(d) Reduced utilization of resources
101. Biosphere reserves are different from National Park as [DPMT 2006]  
(a) Plants and animals are protected in biosphere reserves  
(b) Humans are integral part of biosphere reserves  
(c) Humans are not involved in biosphere reserves  
(d) None of the above
102. Which one of the following is not a wildlife conservation project [KCET 2012]  
(a) Project Dodo (b) Project Indian Bustard  
(c) Project Tiger (d) Project Hangul



103. Rajaji National Park is situated in [DPMT 2003; BVP 2004]  
(a) Tamil Nadu (b) Karnataka  
(c) Uttranchal (d) Rajasthan
104. In-situ conservation of natural genetic resources can be achieved by establishing [DPMT 2004; Kerala CET 2005]  
(a) National park (b) Wild life sanctuaries  
(c) Biosphere reserve (d) All of the above
105. The first white tiger in the world was found in [AIEEE Pharmacy 2004]  
(a) Gir in Saurashtra  
(b) Rewa in Madhya Pradesh  
(c) Sunderbans in Bengal  
(d) Corbett National Park in Uttaranchal
106. Which is correct about white tiger [Odisha JEE 2004]  
(a) White tiger is recessive mutant  
(b) It is a part of subspecies of Indian tiger  
(c) It is a type of albino  
(d) It is a transgenic animal
107. Kaziranga wild life sanctuary is located in [BHU 2002]  
(a) Uttar Pradesh (b) Gujarat  
(c) Jammu and Kashmir (d) Assam
108. Nandan-kanan zoo is known for the [MP PMT 1993]  
(a) Hippopotamus (b) Nilgiri Tahr  
(c) White tiger (d) Whale
109. In India the rhinoceros is the most important protected species in [NCERT; CBSE PMT 1994; KCET 2000, 04; Kerala CET 2003; MP PMT 2003, 04, 06, 13; BVP 2004; RPMT 2005; CBSE PMT (Mains) 2010; Odisha JEE 2011]  
Or  
The single horned rhinoceros is protected at [KCET 2010]  
(a) Dachigam National Park (J & K)  
(b) Kaziranga National Park (Assam)  
(c) Sunderbans National Park (West Bengal)  
(d) Dudhwa National Park (U. P.)
110. Which one of the following is a refuge for Asiatic lion (*Panthera leo persica*) [MP PMT 1994]  
Or  
Lions in India are now found in [MP PMT 2001]  
(a) Kanha National Park (M.P.)  
(b) Corbett National Park (Uttaranchal)  
(c) Kaziranga National Park (Assam)  
(d) Gir Forest (Gujarat)
111. In ecotone some species become abundant [DPMT 2006]  
(a) Sibling species (b) Endemic species  
(c) Rare species (d) Edge species
112. Which one of the following is the matching pair of a sanctuary and its main protected wild animal [CBSE PMT 1995; MP PMT 2012]  
(a) North-Eastern Himalayan Region – Sambhar  
(b) Sunderban – Rhino  
(c) Gir – Lion  
(d) Kaziranga – Musk deer
113. Identify the correct match between 'tiger reserve' and its state [CBSE PMT 1995]  
(a) Corbett – Madhya Pradesh  
(b) Palamau – Odisha  
(c) Manas – Assam  
(d) Bandipur – Tamil Nadu
114. Kanha National Park (M.P.) is famous for [NCERT; MP PMT 1995, 97, 2010; AMU (Med.) 2012]  
(a) Birds (b) Rhinoceros  
(c) Tigers (d) Crocodiles
115. Identify the incorrect statement among the following statements on the effects of deforestation [CBSE PMT 1994]  
(a) It destroys the natural habitat of wild animals  
(b) It alters the local weather patterns  
(c) It speeds up nutrient recycling  
(d) It leads to soil erosion
116. The Ranthambore National Park is located in [CBSE PMT 1994]  
(a) Maharashtra (b) Uttar Pradesh  
(c) Gujarat (d) Rajasthan
117. Which one of the following shows maximum genetic diversity in India [NCERT; CBSE PMT (Pre.) 2011; NEET (Karnataka) 2013]  
Or  
Which one has the largest species variety in India [AIIMS 2012]  
(a) Mango (b) Groundnut  
(c) Rice (d) Maize
118. What is the major cause of diminishing wild life number [CBSE PMT 1998; Pb. PMT 2000; DPMT 2003; KCET 2009]  
(a) Cannibalism  
(b) Habitat destruction  
(c) Falling of trees  
(d) Paucity of drinking water
119. Dudhwa National Park is located in [MP PMT 1998; BVP 2002]  
(a) Madhya Pradesh (b) Himachal Pradesh  
(c) Arunachal Pradesh (d) Uttar Pradesh
120. Figs belong to [DUMET 2010]  
(a) Critical Link species, as they form connecting link between tree and herbs  
(b) Critical Link species, as they establish essential link in the absorbance of nutrients from soil and organic residues  
(c) Keystone species, as they produce large quantity of fruits; and their protection leads to conservation of animals dependent on them  
(d) Keystone species, as they have high degree of animal-dependent pollination
121. The "Central Wildlife Board" was established in [MP PMT 2010]  
(a) 1951 (b) 1955  
(c) 1968 (d) 1970
122. The term alpha diversity refers to [WB JEE 2010]  
(a) Genetic diversity  
(b) Community and ecosystem diversity  
(c) Species diversity  
(d) Diversity among the plants
123. Conservation of organisms in natural habitat is called [Odisha JEE 2010]  
(a) Ex situ conservation (b) In situ conservation  
(c) Both (a) and (b) (d) None of these

124. Which one of the following is one of the characteristics of a biological community [CBSE PMT (Pre.) 2010]

Or

The vertical distribution of different species occupying different levels is called as [J & K CET 2012]

- (a) Sex-ratio (b) Stratification  
(c) Natality (d) Mortality
125. Biodiversity of a geographical region represents [CBSE PMT (Mains) 2011]
- (a) Genetic diversity present in the dominant species of the region  
(b) Species endemic to the region  
(c) Endangered species found in the region  
(d) The diversity in the organisms living in the region

126. Which is the National Aquatic Animal of India

[NEET (Phase-I) 2016]

- (a) Gangetic shark (b) River dolphin  
(c) Blue whale (d) Sea-horse

127. Which of the following is correctly matched

[NEET (Phase-II) 2016]

- (a) Stratification-Population  
(b) Aerenchyma-*Opuntia*  
(c) Age pyramid-Biome  
(d) *Parthenium hysterophorus*-Threat to biodiversity

128. Which of the following National Parks is home to the famous musk deer or hangul [NEET (Phase-II) 2016]

- (a) Dachigam National Park, Jammu & Kashmir  
(b) Keibul Lamjao National Park, Manipur  
(c) Bandhavgarh National Park, Madhya Pradesh  
(d) Eaglenest Wildlife Sanctuary, Arunachal Pradesh

129. Red List contains data or information on

[NEET (Phase-II) 2016]

- (a) Marine vertebrates only  
(b) All economically important plants  
(c) Plants whose products are in international trade  
(d) Threatened species

130. Which one of the following is related to Ex-situ conservation of threatened animals and plants [NEET 2017]

- (a) Wildlife Safari Parks (b) Biodiversity hot spots  
(c) Amazon rainforest (d) Himalayan region

131. The region of Biosphere Reserve which is legally protected and where no human activity is allowed is known as

[NEET 2017]

- (a) Core zone (b) Buffer zone  
(c) Transition zone (d) Restoration zone

**NCERT**

Exemplar Questions

1. Which of the following countries has the highest biodiversity

[NCERT]

- (a) South America (b) South Africa  
(c) Russia (d) India

2. Which of the following is not a cause for loss of biodiversity

[NCERT]

- (a) Destruction of habitat  
(b) Invasion by alien species  
(c) Keeping animals in zoological parks  
(d) Over-exploitation of natural resources

3. Which of the following is not an invasive alien species in the Indian context [NCERT]

- (a) Lantana (b) *Cynodon*  
(c) *Parthenium* (d) *Eichhornia*

4. Where among the following will you find pitcher plant

[NCERT]

- (a) Rain forest of North-East India  
(b) Sunderbans  
(c) Thar Desert  
(d) Western Ghats

5. Which one of the following is not a major characteristic feature of biodiversity hot spots [NCERT]

- (a) Large number of species  
(b) Abundance of endemic species  
(c) Mostly located in the tropics  
(d) Mostly located in the polar regions

6. Match the animals given in column I with their location in column II

Column I

Column II

- A. Dodo i. Africa  
B. Quagga ii. Russia  
C. Thylacine iii. Mauritius  
D. Stellar's sea cow iv. Australia

Choose the correct match from the following [NCERT]

- (a) A-i, B-iii, C-ii, D-iv  
(b) A-iv, B-iii, C-i, D-ii  
(c) A-iii, B-i, C-ii, D-iv  
(d) A-iii, B-i, C-iv, D-ii

7. What is common to the following plants: *Nepenthes*, *Psilotum*, *Rauwolfia* and *Aconitum* [NCERT]

- (a) All are ornamental plants  
(b) All are phylogenetic link species  
(c) All are prone to over exploitation  
(d) All are exclusively present in the Eastern Himalayas

8. What is common to the techniques (i) *in vitro* fertilisation, (ii) Cryo preservation and (iii) tissue culture [NCERT]

- (a) All are in situ conservation methods  
(b) All are ex situ conservation methods  
(c) All require ultra modern equipment and large space  
(d) All are methods of conservation of extinct organisms

9. Amongst the animal groups given below, which one appears to be more vulnerable to extinction [NCERT]

- (a) Insects (b) Mammals  
(c) Amphibians (d) Reptiles

10. Which one of the following is an endangered plant species of India [NCERT]

- (a) *Rauwolfia serpentina*  
(b) *Santalum album* (Sandal wood)  
(c) *Cycas beddomei*  
(d) All of the above



11. What is common to *Lantana*, *Eichhornia* and African catfish [NCERT]  
 (a) All are endangered species of India  
 (b) All are keystone species  
 (c) All are mammals found in India  
 (d) All the species are neither threatened nor indigenous species of India
12. The extinction of passenger pigeon was due to [NCERT]  
 (a) Increased number of predatory birds  
 (b) Over exploitation by humans  
 (c) Non-availability of the food  
 (d) Bird flu virus infection
13. Which of the following statements is correct [NCERT]  
 (a) *Parthenium* is an endemic species of our country  
 (b) African catfish is not a threat to indigenous catfishes  
 (c) Steller's sea cow is an extinct animal  
 (d) *Lantana* is popularly known as carrot grass
14. Which of the below mentioned regions exhibit less seasonal variations [NCERT]  
 (a) Tropics (b) Temperates  
 (c) Alpines (d) Both (a) and (b)
15. Which of the following forests is known as the 'lungs of the planet Earth' [NCERT]  
 (a) Taiga forest  
 (b) Tundra forest  
 (c) Amazon rain forest  
 (d) Rain forests of North East India
16. The active chemical drug reserpine is obtained from [NCERT]  
 (a) *Datura* (b) *Rauwolfia*  
 (c) *Atropa* (d) *Papaver*
17. Which of the following group exhibit more species diversity [NCERT]  
 (a) Gymnosperms (b) Algae  
 (c) Bryophytes (d) Fungi
5. Flamingoes reproduce in [CBSE PMT 1996]  
 (a) Chilka lake (b) Sambhar lake  
 (c) Kutch (d) Mansarovar
6. A threatened species is [Odisha JEE 2003]  
 (a) Only endangered species  
 (b) Only vulnerable species  
 (c) Endangered and rare species  
 (d) Endangered, vulnerable and rare species
7. Which is the first national park established in India [NCERT; BHU 2005; J & K CET 2008; AFMC 2009]  
 (a) Bandipur national park (b) Corbett national park  
 (c) Kanha national park (d) Periyar national park
8. Which Indian state has named all its tourist resorts after different birds [CBSE PMT 1995]  
 (a) Assam (b) Kerala  
 (c) Andhra Pradesh (d) Haryana
9. Write the correct sequence of genetic diversity [GUJCET 2015]  
 (a) Kingdom → Population → Species → Genes → Chromosomes → Nucleotides  
 (b) Polpulation → Species → Chromosomes → Genes → Nucleotides  
 (c) Species → Genes → Population → Chromosomes → Nucleotides  
 (d) Kingdom → Species → Chromosomes → Genes → Nucleotides
10. Which one is a critically endangered animal species [Kerala PMT 2006]  
 (a) *Antelope cervicapra* (b) *Sus salvanius*  
 (c) *Ailurus fulgens* (d) *Calotes versicolor*  
 (e) *Hyla*
11. Which one of the following is the correctly matched pair of an endangered animal and a National Park [CBSE PMT 2006]  
 (a) Wild ass – Dudhwa National Park  
 (b) Great Indian Bustard – Keoladeo National Park  
 (c) Lion – Corbett National Park  
 (d) Rhinoceros – Kaziranga National Park

## Critical Thinking

### Objective Questions

1. The country which hosted the first world earth summit on conservation of environment is  
 (a) Brazil (b) Spain  
 (c) India (d) Peru
2. If the number of a species increase in any national park it can be due to [CBSE PMT 1999]  
 (a) Intraspecific competition (b) Interspecific competition  
 (c) Emigration (d) Mutualism
3. What is the effect of destruction of wild life [KCET 2000]  
 (a) Flood  
 (b) Soil erosion  
 (c) Green house effect  
 (d) Gene for disease resistance cannot be obtained
4. Which one of the following pair is correctly matched to the wild life and national park [CBSE PMT 1996; MP PMT 2003]  
 (a) Rann of Kutch – Wild ass  
 (b) Gir forest – Tiger  
 (c) Manas – Elephant  
 (d) Corbett park – Asiatic lion
12. Elephant is an inhabitant of hot climate. This is suggested by  
 (a) Huge size (b) Fleshy feet  
 (c) Almost hairless skin (d) Small eyes
13. Consider the following statements (A)-(D) each with one or two blanks  
 (A) Bears go into (1) during winter to (2) cold weather  
 (B) A conical age pyramid with a broad base represents (3) human population  
 (C) A wasp pollinating a fig flower is an example of (4)  
 (D) An area with high levels of species richness is known as (5)  
 Which one of the following options, gives the correct fill ups for the respective blank numbers from (1) to (5) in the statements [NCERT; CBSE PMT (Mains) 2011]  
 (a) (3) – expanding, (4) – commensalism, (5) – biodiversity park  
 (b) (1) – Hibernation, (2) – escape, (3) – expanding, (5) hot spot  
 (c) (3) – stable, (4) – commensalism, (5) – marsh  
 (d) (1) – aestivation, (2) – escape, (3) – stable, (4) – mutualism

14. Which of the following has become extinct in India  
[RPMT 1995]

(a) Lion (b) Tiger  
(c) Two horned Rhino (d) Dodo

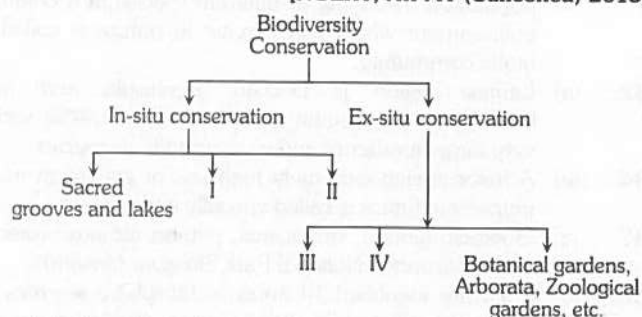
15. Which one of the following is not used for *ex situ* plant conservation  
[NEET 2013]

(a) Botanical Gardens (b) Field gene banks  
(c) Seed banks (d) Shifting cultivation

16. Part of biosphere with adverse environmental conditions is called as  
[MP PMT 2013]

(a) Parabiosphere (b) Eubiosphere  
(c) Peribiosphere (d) Abiosphere

17. The following is a incomplete flow chart depicting in - situ and ex-situ approaches of conserving biodiversity. Critically study and fill in the blanks I, II, III and IV  
[NCERT; AIPMT (Cancelled) 2015]



- (a) I - Biosphere reserves; II - Sacred plants, Home gardens; III - National parks and wildlife sanctuaries; IV - Seed banks, field gene banks, cryopreservation etc  
(b) I - Biosphere reserves; II - Seed banks, field gene banks, cryopreservation; III - Sacred plants, Home gardens; IV - National parks and wildlife sanctuaries etc  
(c) I - Sacred plants, Home gardens; II - National parks and wildlife sanctuaries; III - Biosphere reserves; IV - Seed banks, field gene banks, cryopreservation etc  
(d) I - Biosphere reserves; II - National parks and wildlife sanctuaries; III - Sacred plants, Home gardens; IV - Seed banks, field gene banks, cryopreservation etc

18. An example of *ex situ* conservation is  
[CBSE PMT 2014; WB-JEE 2016]  
Or

Which is the best method of germplasm conservation

[AIIMS 2011]

(a) Wildlife Sanctuary (b) Sacred Grove  
(c) National Park (d) Seed Bank

19. Alexander Von Humbolt described for the first time  
[NEET 2017]

(a) Ecological Biodiversity (b) Laws of limiting factor  
(c) Species are relationship (d) Population Growth equation

## Assertion & Reason

Read the assertion and reason carefully to mark the correct option out of the options given below :

- (a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion  
(b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion  
(c) If the assertion is true but the reason is false  
(d) If both the assertion and reason are false  
(e) If the assertion is false but reason is true

1. Assertion : Diversity observed in the entire geographical area, is called gamma diversity.  
Reason : Bio-diversity decreases from high altitude to low altitude. [KCET 2006]
2. Assertion : Alpha diversity is said to be higher if the dissimilarity between communities is higher.  
Reason : Alpha diversity is a measure of diversity between the communities.
3. Assertion : Bird ringing was carried in Harike Pattan Sanctuary.  
Reason : Bird ringing was helpful in bird census.
4. Assertion : Red data book has a record of all animals.  
Reason : Endangered species are need to be noticed
5. Assertion : Great Indian Bustard is a rare species.  
Reason : Vulnerable species are rare speices.
6. Assertion : National parks are meant for the welfare of the wild life.  
Reason : National parks are controlled by State Governments.
7. Assertion : Pitti island of Lakshadweep is a sanctuary.  
Reason : Lions are protected in Pitti island.
8. Assertion : Tiger is not an endangered animal in India.  
Reason : Project Tiger was launched to improve tiger population.
9. Assertion : A biosphere reserve is a specified area.  
Reason : No restriction on human activities has been imposed in biosphere reserve.

## Answers

### Biodiversity and Conservation

1	c	2	b	3	b	4	b	5	c
6	b	7	b	8	c	9	c	10	b
11	b	12	d	13	c	14	d	15	d
16	b	17	d	18	a	19	a	20	c
21	a	22	a	23	c	24	b	25	b
26	d	27	a	28	a	29	c	30	b
31	b	32	a	33	c	34	e	35	a
36	a	37	a	38	a	39	a	40	c
41	a	42	a	43	a	44	d	45	b
46	a	47	a	48	a	49	a	50	d
51	a	52	b	53	c	54	c	55	d
56	c	57	d	58	a	59	c	60	c
61	d	62	b	63	b	64	d	65	a
66	d	67	c	68	a	69	d	70	c
71	d	72	a	73	a	74	b	75	c
76	b	77	c	78	a	79	c	80	d
81	c	82	d	83	b	84	d	85	b
86	a	87	a	88	d	89	b	90	d

## 1598 Biodiversity and Conservation

91	a	92	b	93	b	94	a	95	a
96	a	97	c	98	a	99	b	100	d
101	b	102	a	103	c	104	d	105	c
106	a	107	d	108	b	109	b	110	d
111	d	112	c	113	c	114	c	115	c
116	d	117	c	118	b	119	d	120	c
121	a	122	b	123	b	124	b	125	d
126	b	127	d	128	a	129	d	130	a
131	a								

## NCERT Exemplar Questions

1	a	2	c	3	b	4	a	5	d
6	d	7	c	8	b	9	c	10	d
11	d	12	b	13	c	14	a	15	c
16	b	17	d						

## Critical Thinking Questions

1	a	2	a	3	d	4	a	5	a
6	d	7	b	8	d	9	b	10	b
11	d	12	c	13	b	14	c	15	d
16	a	17	d	18	d	19	c		

## Assertion and Reason

1	c	2	d	3	a	4	e	5	d
6	c	7	c	8	a	9	c		

## AS Answers and Solutions

## Biodiversity and Conservation

5. (c) The list of endangered species of plants and animals is given in Red Data Book.
6. (b) Wild life week is celebrated on monday of first week of October.
12. (d) IUCN (International Union for the Conservation of Nature and Natural Resources) maintains a red data book in which list of endangered species of plants and animals have been given.
14. (d) Species restricted to small area are called endemic.
15. (d) Biosphere reserves are multipurpose protected area which are meant for preserving genetic diversity in representative ecosystems of various natural biomes and unique biological communities.
16. (b) Ecotone is the transition zone between 2 communities, habitats e.g. forest, grassland. The increased number of species in the region of ecotone is called as edge effect and the species is called as edge species.
17. (d) Biodiversity act of India – In September 2002, India has 581 protected areas of National parks, Sanctuaries covering 4.7% land surface against 10% internationally through this act.
20. (c) Preservation at  $-196^{\circ}$  (liq.  $N_2$ ) can maintain tissue culture, embryos, animal cells/tissues, spermatogoa, etc. is called as cryopreservation. It is an *ex-situ*, conservation method i.e. conservation of organism outside their natural homes other *ex-situ* conservation methods are off site collection and genebanks.
22. (a) Wild life comprises all the living organisms in their natural habitats which are neither cultivated nor tamed.
23. (c) The wildlife is protected in their natural habitat. This is called as *in-situ* conservation. But when wild life is allowed to develop under protection, in areas, than natural habitats such as zoos, botanical gardens etc. This is called as *ex-situ* conservation.
26. (d) An association of a number of different interrelated population belonging to different species in a common environment which can survive in nature is called as biotic community.
32. (a) Largest region is Deccan, Peninsula and most biodiversity rich region is Western Ghats (4%) with a very large number of endemic amphibian species.
34. (e) A taxon facing extremely high risk of extinction in the immediate future is called critically endangered.
37. (a) Hoolock, gibbon, rhinoceros, python etc are protected in the Kaziranga National Park Sibsagar (Assam).
38. (a) India has identified 14 areas as biosphere reserves. Of these, the Nilgiri biosphere reserve, including parts of Karnataka, Kerala and Tamilnadu was declared in 1986 (First one).
41. (a) Flamingo city in the Rann of Kachch is one of the few and biggest breeding site of flaming in the world.
44. (d) Because these are the sub-divisions of biosphere.
47. (a) Botanical Survey of India (BSI) has its head quarters at Howrah (Kolkata). BSI is connected with plant exploration and writing up of regional flora and also preparation of flora of India and red list of plant species.
57. (d) The Lemurs are the inhabitants of Madagascar and the Comoro Island.
59. (c) Western ghat is biodiversity rich zone along with endemism.
60. (c) Taxa whose number have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be immediate danger of extinction are called endangered animals, e.g. lion tailed macaque, crocodile, musk deer, rhino, etc.
73. (a) Man and biosphere programme is an international biological programme of UNESCO (United Nations Educational Scientific and Cultural Organization) which was started in 1971 but was introduced in India in 1986.
74. (b) Endangered species of mammal is about 62, while in reptiles and birds are 6 and 11 respectively.
82. (d) Sacred groves are important to conserve rare and threatened species.
83. (b) Hippopotamus is a large, thick-skinned, herbivorous pig like animal found in rivers and forests of central and equatorial West Africa.
93. (b) A biosphere reserve is basically divided into three zones
  - (i) Core zone - It lies at centre where no human activity is allowed.
  - (ii) Buffer zone - In this zone limited human activities are allowed.
  - (iii) Manipulative zone - In this zone multiple human activities are allowed.



94. (a) Spider monkey is the name for a number of South American monkeys with long legs and long prehensile tail.
96. (a) Habitat alteration and destruction of the natural habitat causes the destruction of breeding grounds, shelter and sources of food.
98. (a) The species living in a restricted or overlapping area of geographical distribution, are called sympatric species.
101. (b) Biosphere reserves are multipurpose protected areas which are meant for preserving genetic diversity in representative ecosystems of various natural biomes and unique biological communities by protecting wild populations, traditional life style of tribals and domesticated plant animal genetic resources. The biosphere reserve was initiated in 1975 under MAB programme of UNESCO.
104. (d) *In-situ* conservation is a conservation and management of important components of biodiversity by a network of conserved areas. National parks, Wild life Sanctuaries and Biosphere reserve are the example of conserved areas where the conservation of natural genetic resources can be achieved.
107. (d) Kaziranga National Park situated in Sibsagar and Nowgong districts of Assam covers approximately 430 sq.km. area and is famous for one - horned rhinoceros of India.
111. (d) Ecotone is a zone of transition between two adjacent communities. In ecotone the density of most of the species is higher than that in neighbouring communities. These species are called edge species and this feature of ecotone as principle of edges.
112. (c) Lion is the main protected wild animal of Gir Sanctuary Gujarat.
114. (c) Kanha National Park situated in Mandla district of M.P. is the largest wild life reserve in the country. It covers approximately 940 sq.km area and is famous for tigers. It came into existence in 1933 and was declared national park in 1955. It is one of the 9 national parks selected by Government of India for 'Project Tiger'
117. (c) Rice has more than 50,000 genetically different strains, while mango has 1000 varieties in India.
118. (b) Falling of trees destroys the natural habitat. It decreases the wild - life number.
119. (d) Dudhwa National Park is located in Uttar Pradesh. Currently Rhinoceros are reintroduced in this park.
122. (b) Alpha diversity is a type of community or ecosystem diversity.
129. (d) Red list of red data book IUCN (New name WCU) involve threatened species of plants & animals

### Critical Thinking Questions

1. (a) Brazil hosted the first world earth summit on conservation of plants.
4. (a) Wild ass sanctuary is situated at Rann of Kutch, Surendra Nagar, Gujarat.
18. (d) *In situ* conservation strategies – National park, biosphere reserve, sanctuaries, sacred groves.

### Assertion and Reason

- (c) Biodiversity is not uniform on the earth. It varies with change in latitude or altitude. Biodiversity increase, when we move from high to low latitude (i.e. from the poles to the equator).
- (d) The occurrence of different kinds of organisms reflects the biological diversity. The term biodiversity refers to the totality of genes, species, and ecosystem of a region. Biodiversity includes three hierarchical levels : (i) Genetic diversity (ii) Species diversity (iii) Community and ecosystem diversity. Diversity at the level of community and ecosystem has three perspectives which are called Alpha, Beta and Gamma diversity. Alpha diversity (within-community diversity) refers to the diversity of organisms sharing the same community/habitat. A combination of species richness and equitability/evenness is used to represent diversity within a community or habitat. Species richness is the number of species per unit area. The number of species increases with the area of the site. Generally, greater the species richness, greater is the species diversity. However, number of individuals among the species may also vary, resulting into differences in evenness or equitability and consequently in diversity. Species frequently change when habitat or community changes. The rate of replacement of species along a gradient of habitats or communities is called beta diversity (between-community diversity). Higher the heterogeneity in the habitats in a region or greater the dissimilarity between communities, higher is the beta diversity. Diversity of the habitats over the total landscape or geographical area is called gamma diversity.
- (a) Bird ringing or banding is fixing an identifying ring or band to a bird's leg indicating the time and place of the bird's visit. It is useful in bird census. It was carried out at Harike by Bombay Natural History Society from 1980 to 1985.
- (e) Red data book contains a record of species of an area which are known to be in danger. Endangered species need to be noticed because only after that the planning for their protection and improving their population can be given the proper direction.
- (d) Rare species are those which have small population in the world. They are usually confined to limited areas or are thinly scattered over a more wide area. Great Indian Bustard are the species which are in danger of extinction, hence are *endangered species*. Black buck population is likely to be in danger of extinction, hence *vulnerable*.
- (c) A National park is an area which is strictly reserved for the welfare of wild life. No human activities are allowed there. Central Governments control them but are administered by State Government.
- (c) The Pitti island in Lakshadweep has been declared as a protected bird sanctuary under its wild life act. It is populated by exotic birds.
- (a) There are 21 tiger reserves in India. To save the tiger from extinction in India Project Tiger was launched on April 1, 1973. This project planned to create tiger reserves in selected areas of India. Due to this effort considerable improvement has been observed in tiger population.
- (c) A biosphere reserve is a specified area in which multiple use of the land is permitted by dividing it into zones, each for a particular activity. These zones are
  - Core (no human activity is there),
  - Buffer (limited human activity is permitted),
  - Manipulation zone (several human activities can occur in this zone).

## Biodiversity and Conservation

## SET Self Evaluation Test

1. Species going to be extinct due to low reproductive rate is  
[MP PMT 2007; Odisha JEE 2011]  
(a) Lion (b) Bald eagle  
(c) Giant panda (d) Island sps
2. Which place is famous for hosting thousands of migrating birds coming from Siberia in every winter [MP PMT 2011]  
Or  
Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer thousands of migratory birds from Siberia and other extremely cold northern regions move to [CBSE PMT 2014]  
Or  
Siberian crane is a regular visitor of bird sanctuary [KCET 1996]  
(a) Kanha National Park, Balaghat, Madhya Pradesh  
(b) Keoladev National Park, Bharatpur, Rajasthan  
(c) Kaziranga National Park, Assam  
(d) Corbett National Park, Nainital, Uttaranchal
3. Ecological diversity includes [MP PMT 2005]  
(a) Species diversity (b) Genetic diversity  
(c) Ecosystem diversity (d) All of the above
4. Biosphere is [Pb. PMT 2000]  
(a) Global ecosystem  
(b) Global community  
(c) Living organism  
(d) Count of organism on earth
5. "Evil Quartet" is related with [MP PMT 2011]  
(a) Loss of Biodiversity (b) Loss of Alien Species  
(c) Loss of standing crop (d) Loss of climax community
6. The species, though insignificant in number, determine the existence of many other species in a given ecosystem. Such species is known as [KCET 2010]  
(a) Endemic species (b) Sacred species  
(c) Extinct species (d) Keystone species
7. The dolphin found in Chilika lake is [Odisha JEE 2010]  
(a) Ganges dolphin (b) Irrawaddy dolphin  
(c) Narwhale (d) Porpoise
8. Which animal is symbol of 'World Wide Fund for Nature'  
(a) Red panda (b) Polar bear  
(c) Lion (d) None
9. 'Project Tiger' in India was started in [MP PMT 1994, 2010]  
Or  
New 'Wild Life Protection Act' was passed in [Manipal 2003; Odisha 2003; WB JEE 2009; MP PMT 2012]  
(a) 1970 (b) 1972  
(c) 1981 (d) 1985
10. At present, the lions (*Panthera leo*) are found only in [MP PMT 2000]  
(a) Africa (b) India  
(c) Both India and Africa (d) Zoos
11. Which of the following bird has gained importance as wild life in recent years  
(a) Pheasant (b) Egret  
(c) Indian Bustard (d) Pelican
12. Core zone, buffer zone and manipulation zone are found in [MP PMT 2009]  
(a) National park (b) Sanctuary  
(c) Tiger reserve (d) Biosphere reserve
13. Hippopotamus is found in  
(a) Amazon river (b) Nile river  
(c) Ganges river (d) Darling river
14. Source of 'Ivory' is  
(a) Tusks of elephant (b) Bones of whale  
(c) Antlers of deer (d) Bones of elephant
15. The venue and year of the Earth Summit on Conservation of Biodiversity was [NCERT; Kerala PMT 2008]  
(a) South Africa, 2002 (b) Rio de Janeiro, 1992  
(c) Johannesburg, 2004 (d) Stockholm, 1974  
(e) Ramsar, 1974
16. Corbett national park is in [KCET 2001]  
(a) Uttaranchal and is famous for tiger  
(b) Rajasthan and is home for black buck  
(c) Punjab and is home for antelopes  
(d) Himachal Pradesh and is famous for birds
17. Identify the odd combination of the habitat and the particular animal concerned [CBSE PMT 2007]  
(a) Dachigam National Park – Snow Leopard  
(b) Sunderbans – Bengal Tiger  
(c) Periyar – Elephant  
(d) Rann of Kutch – Wild Ass

## AS Answers and Solutions

1	c	2	b	3	a	4	a	5	a
6	d	7	b	8	a	9	b	10	c
11	c	12	d	13	b	14	a	15	b
16	a	17	c						

2. (b) Every winter the famous Keolado National Park (Bharatpur) in Rajasthan host thousands of migratory birds coming from Siberia and other extremely cold northern region.